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The Pursuit of Belonging

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Abstract

Loneliness is the subjective sense of social isolation (Cacioppo & Patrick, 2008). Chapter 1 argues that loneliness is puzzling because of the evidence that people form connections easily and break connections reluctantly (Baumeister & Leary, 1995). In Chapter 1, I argue that loneliness may result from lower familiarity with others and higher residential mobility of modern society. This explanation is challenged by the social pain model. This model argues loneliness evolved to motivate connection when belonging is inadequate (Cacioppo & Patrick, 2008). Loneliness should motivate lonely people to connect with others, and thus override the effects of lower familiarity and greater residential mobility. Therefore, either loneliness is insufficient at motivating lonely people to form connections, or lonely people lack the ability to form connections despite motivation. This thesis examined the overriding research question of whether lonely people pursue belonging, and if so, whether this pursuit is successful.

This thesis examined the pursuit of belonging by examining sociability. In Chapter 2, I analysed historical trends of sociability, social networks, and loneliness. I reviewed evidence that sociability has shown large decreases in recent decades. People are less likely to attend church, join unions, or join clubs (Putnam, 2000). I assessed whether this decline in sociability is associated with increases in loneliness. In Study 1, I examined trends in loneliness among college students, and found that over recent decades loneliness has decreased. In Study 2, I examined data from a representative survey of high school students and found that over recent decades loneliness decreased, whereas social networks became poorer. Chapter 2 suggests sociability is not a major determinate of loneliness, but only provides indirect evidence of this link.

In Chapter 3, I directly assessed the link between sociability and loneliness. I used a cross-sectional design to test the association between sociability and loneliness. I found that lonely people were less sociable and this was independent of other predictors of loneliness including communal orientation, acceptance, and reinforcement sensitivity. Chapter 3 had two main limitations. First, chapter 3 was cross-sectional. Second, the sociability measure used appears to assess enjoyment around others, whereas sociability may encompass tendency and effort to engage with others, which may be distinct from enjoyment.

In Chapter 4, I addressed these limitations by conducting a longitudinal study, and used a measure that assessed multiple aspects of sociability. I used an exploratory factor analysis on the existing sociability scale plus novel items and found five additional factors of sociability: desire for belonging, tendency to engage with strong ties, effort networking,

effort with strong ties, and tendency to engage with weak ties. I measured sociability and loneliness at two time points seven weeks apart. Two cross-lagged relationships were found that supported the social pain model. First, collective disconnection—the type of loneliness associated with group ties—led to more social enjoyment. Second, isolation—the subjective feeling of loneliness—led to greater desire for belonging. The social pain model contrasts with the social desensitization model, which argues that lonely people become desensitized to belonging and therefore predicts that loneliness will lead to less sociability (Moller, Deci, & Elliot, 2010). I found one cross-lagged relationship that supported the social desensitization model. Relational disconnection—the type of loneliness associated with interpersonal ties—led to less social desire. I found some evidence that sociability reduces loneliness**.** The tendency to engage with strong ties reduced isolation. Low levels of shyness reduced feelings of isolation. In contrast, one form of sociability actually increased loneliness. The tendency to engage with strong ties led to more relational disconnection.

The previous three chapters looked at pursuing belonging through sociability. In Chapter 5, I argued that people derive a sense of belonging by being valuable to others, and that people may become valuable to others through work. In Chapter 5, I presented the findings of a longitudinal study measuring work engagement and loneliness at two time points, three months apart. There was no clear evidence that belonging affected work engagement or that that work engagement reduced loneliness over time.

The thesis concludes in Chapter 6 summarising the evidence supporting both the social pain and social desensitization models for sociability. Loneliness appeared to increase and decrease people's effort to connect with others, depending on the context. I did not find support for work satisfying belonging or for belonging affecting work engagement. I found sociability could reduce loneliness, but it could also increase loneliness. Thus, loneliness can increase and decrease the motivation to pursue belonging, but the motivation to pursue belonging does not strongly affect loneliness.

Declaration by author

This thesis is composed of my original work, and contains no material previously published or written by another person except where due reference has been made in the text. I have clearly stated the contribution by others to jointly-authored works that I have included in my thesis.

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Publications during candidature

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Contributor	Statement of contribution
Clark (Candidate)	Collected and analysed data (100%) Designed studies (90%) Wrote the initial draft (100%) Edited and revised the paper (34%)
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Tobin	Designed studies (5%) Edited and revised the paper (33%)

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Tobin	Designed studies (5%) Edited and revised the paper (33%)

Contributions by others to the thesis

Dr Natalie Loxton and Dr Stephanie Tobin, my two doctoral supervisors, provided feedback on drafts, provided literature recommendations, provided advice on statistical analysis, and provided advice on study design.

Statement of parts of the thesis submitted to qualify for the award of another degree

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Keywords

Belonging, loneliness, sociability, work engagement, social pain, social desensitization

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List of Abbreviations used in the thesis

AIC	Akaike Information Criterion
BAS	Behavioural Activation System
BIS	Behavioural Inhibition System
CFI	Comparative Fit Index
CI	Confidence Interval
FFFS	Fight, Flight, or Freeze System
LLCI	Lower Limit Confidence Interval
MTF	Monitoring the Future
r-BAS	revised Behavioural Activation System
r-BIS	revised Behavioural Inhibition System
r-RST	revised Reinforcement Sensitivity Theory
R-UCLA	The revised UCLA loneliness scale
RST	Reinforcement Sensitivity Theory
RMSEA	Root-Mean-Square Error of Approximation
SEM	Structural Equation Modelling
SRMR	Standardized Root Square Mean Residual
TLI	Tucker–Lewis index
ULCI	Upper Limit Confidence Interval

Chapter 1
Introduction: The Pursuit of Belonging

> "If psychological well-being is linked to having deep intimate contacts, being a valued member of an enduring social group, and being enmeshed in a network of extended kin, then the conditions of modern living seem designed to interfere with human happiness."
>
> Buss (2000, p. 17)

> "Those only are happy who have their minds fixed on some object other than their own happiness"
>
> Mill (1873, p. 100)

Loneliness is the subjective experience of a lack of social connection and predicts poor immune function (Pressman et al., 2005), higher stress hormones (Kiecolt-Glaser et al., 1984), higher suicidal ideation (Stravynski & Boyer, 2001), and greater depression (Wei, Russell, & Zakalik, 2005). The existence of loneliness is puzzling because people form social connections easily and break social connections reluctantly (Baumeister & Leary, 1995). Furthermore, loneliness should, according to the social pain model (Cacioppo & Patrick, 2008; Eisenberger, Lieberman, & Williams, 2003), motivate people to pursue connection, yet despite this motivation many fail to find belonging (American College Health Association, 2010; Bradburn, 1969). The puzzle may be answered by differences between how people interacted in the evolutionary environment and modern society. People in the evolutionary environment likely lived in the same group of closely related kin where familiarity and exposure would have been much higher, both of which facilitate connections. Another potential answer is suggested by the social desensitization model (Moller et al., 2010). Contrary to the social pain model, this model proposes that loneliness desensitizes people to belonging, thus making them less likely to pursue belonging. This thesis will examine how people pursue belonging, using the social pain and social desensitization model, in order to gain insight into the puzzling phenomenon of loneliness.

The Puzzle of Loneliness

People have a very strong need to belong, which requires pleasant interactions in the context of mutual caring (Baumeister & Leary, 1995). In their comprehensive review, Baumeister and Leary summarised a large body of evidence for a need to belong, including

evidence that people form relationships easily, break relationships reluctantly, form social groups in all known cultures, suffer pathologies when isolated, and experience emotions and cognition that reflect concern for relationships. The pathological effects of isolation have been noted for a long time. William James (1980, p. 430) noted, "To be alone is one of the greatest evil for him. Solitary confinement is by many regarded as a mode of torture too cruel and unnatural for civilised countries to adopt." Also indicating the power of the need to belong, relationships appear to form in the most adverse circumstances. In the Robber's Cave study, people formed friendships with people from previously antagonistic groups, when they were brought together to work towards a common goal (Sherif, Harvey, White, Hood, & Sherif, 1988). People put into contact with previously stereotyped and disliked outgroup members, reversed their prejudice based on the amount of contact they had, demonstrating the power of the need to belong to override prejudice (Wilder & Thompson, 1980). Further showing the strength of the need to belong, people often feel extreme distress at rejecting potential lovers, even when they are certain they do not want romantic involvement, indicating that a desire to connect with others is indiscriminate and is difficult to override with other concerns (Baumeister, Wotman, & Stillwell, 1993).

As well as having the motivation to form connections, people also possess various social abilities. Social abilities should evolve because people unable to effectively form attachments and navigate the social environment would be at an evolutionary disadvantage (Dunbar & Shultz, 2007). Many adaptations to manage the social environment have been described in the literature. For instance, people have evolved to be able to read other people's point of view (Baron-Cohen, 1995), they can detect when others are not carrying their fair share (Cosmides, 1989) and even infants show sophisticated social perception (Hamlin, Wynn, & Bloom, 2007). It is argued that navigating the social environment created an evolutionary pressure for greater intelligence which caused humans to develop such large brains relative to their body size (Dunbar & Shultz, 2007). The evolutionary roots for forming connection appear to be deep. Long-terms bonds are associated with better health and the survival of offspring in dolphins, baboons and chimpanzees (Seyfarth & Cheney, 2012). Therefore, evolution should favour animals that are more skilled in forming long-term bonds and therefore these skills should become widespread.

The fact that people form bonds easily suggests that belonging should be easy to satisfy. The idea that belonging needs should be easy to satisfy was summarised by Weiss (1973, p. 12), who said, "All that is necessary is to be pleasant, outgoing, interested in others rather than in oneself." In contrast, many people cannot satisfy their need to belong. In

Britain, 7% of older people rate themselves as lonely (Victor, Scambler, Bowling, & Bond, 2005). In America, one survey found 26% of people said they felt very lonely at some time over the past few weeks (Bradburn, 1969). Among American college students, for the period of the last two weeks, 21.1% said they had felt very lonely, while for the period of the past 12 months, 56.4% had felt very lonely (American College Health Association, 2010). Loneliness is frequently high enough that studies find it is associated with negative outcomes such as poor sleep quality (Cacioppo et al., 2002), ill health (House, Landis, & Umberson, 1988) and pathology (Cacioppo & Patrick, 2008).

Resolving the Puzzle

Modern levels of loneliness may be explained by a mismatch between the environment humans evolved in and modern society. Evolution is a slow process, whereas changes over recent human history such as agriculture and the industrial revolution have been rapid; the environment in which human beings evolved is dramatically different from modern society (Pinker, 1997). Human beings are thought to be optimally adapted for the Pleitestoscene period on the African Savannah, where humans lived as hunter gatherers in groups up to 150 (Dunbar, 1998). Modern hunter gathers give some insight into the social situation of the Pleitestoscene; modern hunter gathers live in residential bands under 30 adults (K. R. Hill et al., 2011).

Modern levels of loneliness may be explained by reductions in the amount of familiarity people experience with other people. Familiarity has been shown to be very important to social relationships. Mere exposure to people increases liking (Zajonc, 1968). People are more likely to form friendships with people they see on a regular basis (Festinger, Schachter, & Back, 1963). Familiarity overrides previous strong biases against a disliked outgroup (Wilder & Thompson, 1980). In the evolutionary environment, people lived in the same extended family network for their entire lives, seeing the same people regularly over several years. Modern people do not enjoy the same level of frequent contact and familiarity. People living in cities have even greater reductions in familiarity, facing large anonymous crowds on a daily basis. Cities appear to impair social engagement. People who live in metropolitan areas are less likely to be members of groups, attend club meetings, and attend church (Putnam, 2000). People who live in cities are also less likely to help strangers (Korte & Kerr, 1975; Milgram, 1970; Steblay, 1987).

Another aspect of the modern environment, not present in the evolutionary past and reducing levels of familiarity with people, is greater residential mobility. In the evolutionary environment, there were no planes or cars, restricting the amount of travel people could take.

Though modern hunter gatherers do move from village to village, this occurs only every few years and is frequently the result of marriage or transition from childhood to adulthood (Shostak, 1983). In modern times, 20% of Americans move per year (Shumaker & Stokols, 1982). Research has found that people who moved more frequently as children had diminished well-being and increased mortality, but only if they were introverted (Oishi & Schimmack, 2010). Furthermore, this effect was mediated by a lack of close social relationships. This suggests that mobility disrupts people's ability to form meaningful connections with each other. It may be that human beings are designed to form connections with others in situations where they see the same people on a relatively constant basis over a long period of time.

Social Pain

Although familiarity and residential mobility are potential explanations of loneliness, they are not complete explanations because low familiarity and residential mobility should be counteracted by social pain. The pain model argues that loneliness is designed to detect poor connection and motivate people to connect with others (Cacioppo & Patrick, 2008). If people felt less belonging because of low familiarity and residential mobility, their feelings of loneliness would prompt them to be more social, which should reduce their loneliness. Many studies that have manipulated rejection are consistent with the social pain model. Rejection improved memory for social events (Gardner, Pickett, & Brewer, 2000). Rejection improved performance on a task when it was described as indicative of getting on well with others, but not if it was described as diagnostic of good health (DeWall, Baumeister, & Vohs, 2008). Rejection improved performance on a task when their performance was compared to others, but not when performance was not compared to others (Jamieson, Harkins, & Williams, 2010). Rejection increased the probability that people would express an interest in working with others, perceive others as friendly, and allocate more cash rewards to a partner (Maner, DeWall, Baumeister, & Schaller, 2007). The implications of the social pain model are that loneliness should only result if 1) people did not have the ability to form social connections, despite the motivation, or 2) if social pain is not motivating people as theorized.

Social Desensitization

However, social pain may not counteract the disruption to belonging due to low familiarity and residential mobility. An opposing process to social pain has been proposed—social desensitization. Social desensitization refers to loneliness leading to reduced motivation to pursue connection; for instance, if a person is rejected, they may expect more

rejection in the future, which would reduce their willingness to approach others (Moller et al., 2010). The social desensitization model is consistent with studies that experimentally manipulated rejection that found rejection makes people less helpful (Twenge, Baumeister, DeWall, Ciarocco, & Bartels, 2007), and more aggressive (Twenge, Baumeister, Tice, & Stucke, 2001),

Although people form relationships easily and break relationship reluctantly (Baumeister & Leary, 1995), people are not universal in their sociability, and people do reject others. People primarily reject others as part of intergroup conflict, to avoid pathogens, or to avoid people who are poor exchange partners—for instance, people who are uncooperative (Kurzban & Leary, 2001). If a person appears diseased, is from the wrong group, or is a poor exchange partner, they could be rejected by people, leaving them lonely. However, these reasons for rejection are unlikely explanations for loneliness. First, intergroup conflict is unlikely a reason for loneliness because, although one group may reject someone, their in-group should not. Support from their in-group should buffer against prejudice because they draw support from their in-group (Crocker & Major, 1989). Second, disease is an unlikely explanation because advances in public health mean few people appear diseased. Third, being a poor exchange partner should not be an explanation for loneliness because people should be motivated to be good exchange partners to avoid loneliness, given the evolutionary consequences of being rejected by others (Seyfarth & Cheney, 2012). If lonely people were poor exchange partners, despite the evolutionary consequences, this contrast would require explanation but would be consistent with the social desensitization model.

Cognitive Discrepancy Model

Social pain and social desensitization could be affected by how people develop expectations about their relationships, which is delineated by the cognitive discrepancy model. The cognitive discrepancy model states that loneliness emerges when a person's social network is smaller or less satisfying than the person desires or expects (Peplau & Perlman, 1979). In the cognitive discrepancy model, loneliness is not only determined by social networks but also by expectations about social networks. Peplau and Perlman argue that people's expectations of their social network emerge from social comparison processes, previous relationships, and expectations of future relationships. Some people with high expectations may require vast social networks and some people with low expectations may desire little contact, although Peplau and Perlman argue that everyone desires some contact. The cognitive discrepancy model has been supported by empirical data. Although social networks are poor predictors of loneliness (Stokes, 1985), the discrepancy between a person's

ideal and actual level of close friendships does predict loneliness (Russell, Cutrona, McRae, & Gomez, 2012).

Peplau and Perlman (1979) note that loneliness can reduce (social desensitisation) and increase motivation (social pain). They argue that this contradiction can be resolved by examining how people develop expectations of their relationships. One factor that can affect expectations is norms. For instance, teenagers may consider it crucial to have a romantic date at certain times. Norms can differ for different age groups, which can mean that expectations for relationships vary. Peplau and Perlman argue that people can cope with loneliness by 1) reducing their desire for social contact 2) achieving more satisfying social contact or 3) altering the importance of the gap between desired and achieved contact. The first strategy is consistent with social desensitisation, the second is consistent with social pain, and the third is consistent with social desensitisation, although not as closely as the first strategy.

The nature of needs

There are many possible needs besides belonging. H. A. Murray (1938) argued that there may be a very large number of needs. Two heavily investigated needs, other than belonging, are autonomy and competence. Autonomy is experiencing choice and feeling that one is the initiator of one's actions, and competence is when people feel that they are succeeding and achieving goals (Deci et al., 2001).

The evidence for the need to belong can be interpreted as evidence of other needs such as autonomy and competence. Earlier we cited evidence for the need to belong that people form relationships easily, break relationships reluctantly, experience emotions and cognition that reflect concern for relationships, form social groups in all known cultures, and suffer pathologies when isolated (Baumeister & Leary, 1995). People may form relationships easily because it provides a sense of competence from fulfilling social roles. When people are happy from being married and distressed from being divorced, these feelings could reflect their reaction to success and failure at an important goal. People may form relationships in all known cultures because people require the cooperation of others to achieve other goals. The evidence concerning pathology can be reinterpreted. Earlier, we quoted William James (1980, p. 430) who said, "To be alone is one of the greatest evil for him. Solitary confinement is by many regarded as a mode of torture too cruel and unnatural for civilised countries to adopt." A person in solitary confinement has reduced opportunity to satisfy their need for autonomy and competence. Furthermore, a person could argue that boredom could be causing the pathology observed and that reactions to solitary confinement does not provide evidence for the need for belonging, autonomy, or competence.

Experiences can involve the needs for belonging, autonomy and competence, and it can be difficult to separate the working of the different needs. Peplau and Perlman (1979) point out potential overlap between loneliness and competence concerns, arguing that loneliness can be understood from an achievement perspective. They point out that people are judged not only on job prestige but also on the relationships they have; loneliness is a sign of failure. Peplau and Perlman also point to the overlap between autonomy and the need to belong, arguing that control can reduce feelings of loneliness. This argument is supported by empirical work. In one study, elderly people were visited over two months (Schulz, 1976). Elderly people felt less loneliness when they were able to control the timing of visits than when they were not able to control the timing of visits, although the total interaction time was the same for those with and without control. Furthermore, partners who initiate the dissolution of a romantic relationship feel less distress than partners who did not initiate the dissolution, although both report increased depression and loneliness (C. T. Hill, Rubin, & Peplau, 1976).

The need to belong has been dissected into two different needs. Loneliness can be divided into social and emotional loneliness. Social loneliness reflects a lack of casual relationships, whereas emotional loneliness reflects a lack of close relationships, such as romantic relationships (R. S. Weiss, 1973). The distinction between social and emotional loneliness has implications for the social pain and social desensitization model. People experiencing social loneliness may join clubs to relieve their loneliness, whereas people experiencing emotional loneliness may try to become closer to their existing friends to relieve their loneliness.

Outline

The overarching aim of this thesis is to examine the pursuit of belonging in order to gain insight into why some people are lonely. In Chapter 2, I examined the historical trends on sociability, social networks, and loneliness. In Chapter 3, I examined the cross-sectional association between sociability and loneliness. In Chapter4, I used a longitudinal design to examine the relationship between sociability and loneliness. In Chapter 5, I argue that belonging may be also satisfied through work, and I conducted a longitudinal study to examine the relationship between work engagement and loneliness. Chapter 6 provides the conclusion and interprets the findings in light of the social pain model, the social desensitization model, and whether the pursuit of belonging reduces loneliness.

Chapter 2

People pursue belonging through sociability, and sociability appears to be decreasing over time. In comparison to decades past, people are less likely to join clubs, have fewer confidants, and are less likely to perceive others as trustworthy (McPherson, Smith-Lovin, & Brashears, 2006; Putnam, 2000). Chapter 2 examines whether this decline in sociability has coincided with an increase in loneliness. Chapter 2 is taken from published work (D. M. T. Clark, Loxton, & Tobin, 2015a).

Abstract

We examined changes in loneliness over time. Study 1 was a cross-temporal meta-analysis of 48 samples of American college students who completed the Revised UCLA loneliness scale (total N = 13,041). In Study 1, loneliness declined from 1978 to 2009 (d = -0.26). Study 2 used a representative sample of high school students from the Monitoring the Future project (total N = 385,153). In Study 2, loneliness declined from 1991 to 2012. Declines were similar among White students (d = -0.14), Black students (d = -0.17), male students (d = -0.11), and female students (d = -0.11). Different loneliness factors showed diverging trends. Subjective isolation declined (d = -0.20), whereas social network isolation increased (d = 0.06). We discuss the declines in loneliness within the context of other cultural changes, including changes to group membership and personality.

Temporal patterns in sociability, social networks, and loneliness

People need to connect with others (Baumeister & Leary, 1995), and failing to satisfy this need causes loneliness, which correlates with poor sleep quality (Cacioppo & Patrick, 2008), poor immune function (Pressman et al., 2005), higher stress hormones (Kiecolt-Glaser et al., 1984), and dysregulation of the body's inflammatory system (Hackett, Hamer, Endrighi, Brydon, & Steptoe, 2012). A widespread opinion is that modern society is increasingly lonely. Authors of news articles declare that "we have never been more detached from one another, or lonelier" (Marche, 2012, para. 3), and the title of an article in The New York Times states, "The Lonely American Just Got a Bit Lonelier" (Fountain, 2006). These articles are based on research that demonstrates declining social engagement; in comparison to decades past, people are less likely to join clubs, have fewer confidants, and are less likely to perceive others as trustworthy (McPherson, Smith-Lovin, & Brashears, 2006; Putnam, 2000). Social engagement through the internet, however, could be replacing traditional forms of sociability (Deters & Mehl, 2013), and some suggest the evidence of social decline is based on flawed indicators (Fischer, 2011). These uncertainties suggest that although sociability patterns have changed, the need to belong may still be satisfied. The purpose of this paper is to examine changes in loneliness over time.

Changes in Sociability

Several societal trends suggest loneliness is increasing. Americans have become less likely in recent decades to join clubs, vote, have dinner with friends, and go on picnics (Putnam, 2000). Since the 1970s, Americans' trust in individuals has declined (Paxton, 1999). Americans reported declines in their number of confidants. In 1985, 10% of people reported they discuss important matters with no one; in 2004, 25% reported the same (McPherson et al., 2006). Evidence supporting declines in sociability has been criticized because it often relies on single items, which Fischer (2011) describe as "partial, confounded, and idiosyncratic" (p. 11). Researchers question findings that suggest Americans have fewer people with whom to discuss important matters because participants may interpret the term "important matters" differently. Approximately half of participants who report they do not talk to anyone about important matters also report that in the past 6 months, they had nothing important about which to talk (Bearman & Parigi, 2004). Similar problems emerge in other measures of social networks. People interpret "friends" and "close friends" differently, and if a previous survey question was taxing, participants may reduce efforts to recall the extent of social networks for subsequent questions (Fischer, 2011).

A limitation of examining only objective indicators of social engagement is that subjective feelings of loneliness may not match objective isolation. Health outcomes relate more consistently with subjective feelings of loneliness than with objective indicators (Cacioppo & Patrick, 2008). In one study, both subjective ratings of loneliness and objective ratings of social network size predicted immune response to vaccination independently (Pressman et al., 2005), and another study found that quality rather than frequency of social interactions was more important to physical and psychological health outcomes (Reis, Wheeler, Kernis, Spiegel, & Nezlek, 1985). Although some forms of sociability have decreased, others forms may have increased (Paxton, 1999). One opportunity for increased sociability is the internet. Online groups help people with marginalized identities (e.g., gay or lesbian) accept their identities, reducing loneliness (McKenna & Bargh, 1998). Posting on social networking sites decreases feelings of loneliness (Deters & Mehl, 2013). The internet, however, may impede social connection. Self-disclosure on the internet elicits more negative reactions from others than similar self-disclosure in person (Forest & Wood, 2012), and social media may provide an avenue for people to be ignored, lowering perceptions of belonging (Tobin, Vanman, Verreynne, & Saeri, 2014).

Constructs that correlate with loneliness have changed over the past few decades. Loneliness correlates with lower extraversion and self-esteem (Civitci & Civitci, 2009; Saklofske & Yackulic, 1989), and extraversion and self-esteem have increased over time (Twenge, 2001a; Twenge & Campbell, 2001), suggesting loneliness is decreasing. Loneliness correlates with lower empathy and secure attachment (Davis, 1983; DiTommaso, Brannen-McNulty, Ross, & Burgess, 2003), and empathy and secure attachment declined (Konrath, Chopik, Hsing, & O'Brien, 2014; Konrath, O'Brien, & Hsing, 2011), suggesting loneliness is increasing. Because these findings do not clearly suggest whether loneliness is increasing or decreasing, a direct examination of loneliness over time is warranted.

Study 1

Study 1 examined changes in loneliness over time using cross-temporal meta-analysis. Cross-temporal meta-analyses allow assessment of mean differences of group members of the same age over time, allowing analysis of generational differences (Twenge, 2001a). This approach has been used to examine changes in empathy, extraversion, and self-esteem (Konrath et al., 2011; Twenge, 2000). We examined scores on the Revised UCLA loneliness scale (R-UCLA; Russell, Peplau, & Cutrona, 1980). The R-UCLA demonstrates adequate internal consistency ($\alpha = .94$) and measures loneliness indirectly with items such as "My social relationships are superficial." Although many other loneliness scales exist and

using multiple scales is preferable, only the R-UCLA has appeared in a sufficient number of studies to offer reliable estimates of loneliness over time. We also examined gender differences in loneliness. In some studies that use the R-UCLA, males scored higher, but in other studies, no gender difference was found (Russell et al., 1980).

Method

Literature search and inclusion criteria. Using Web of Knowledge—a comprehensive database containing most journals in the social, behavioral, and medical sciences—we searched for studies that cited the R-UCLA (Russell et al., 1980). We used the following inclusion criteria: (a) studies must have used all 20 items of the R-UCLA loneliness scale; (b) participants must have been American college students from 4-year institutions, excluding 2-year and military colleges; (c) participants must not have been selected for inclusion in the study based on R-UCLA scores; (d) participants must not have been selected based on attributes that predict loneliness such as shyness, sociability, or being in a romantic relationship; (e) studies must not contain interventions that affected R-UCLA scores; and (f) studies must have provided an overall loneliness mean. When researchers did not report loneliness means, we contacted the authors and requested this information. For longitudinal studies, we used the first loneliness mean.

Scoring. Researchers used a variety of methods to score the R-UCLA scale. Although the original article used the sum of a 4-point scale (Russell et al., 1980), many researchers used 5- or 7-point scales, averaging or summing to calculate loneliness. We excluded studies using alternate scorings because scoring can change the results of cross-temporal meta-analyses (Gentile, Twenge, & Campbell, 2010).[1] When researchers did not report how they scored the scale and we were able to locate their e-mail addresses, we contacted them for details of their scoring methods. When unable to identify a scoring method, we excluded the study. The final sample included 48 studies of American college students.

Year of collection. We followed procedures of previous cross-temporal meta-analyses to estimate the year of data collection (Konrath et al., 2011). We recorded a collection date if a paper reported the date of data collection or if we were informed of a date during e-mail correspondence. If an article contained the date the journal received it for review, we subtracted one year to obtain an estimate of when data were collected. If there were no other indicators, we used the date of publication minus two years.

Data analysis strategy. We followed the data analysis strategy of previous cross-temporal meta-analyses (Konrath et al., 2011). We correlated mean loneliness scores with year of data collection. We weighted scores by sample size to produce a better estimate of a

population mean. We then calculated the effect size of changes in loneliness by using predicted loneliness scores derived from the following regression equation: $y = Bx + c$, where B = the unstandardized regression coefficient, c = the regression constant, y = the predicted loneliness score, and x = the year. We used this equation to compare predicted loneliness levels in various years to examine magnitude of change. We divided changes in loneliness by the standard deviation to represent the effect size in standard deviation units. We calculated the standard deviations by averaging all the standard deviations reported in the studies. We did not use group-level standard deviations (i.e. variations between studies) because they were considerably smaller than individual standard deviations, and researchers typically interpret effects sizes at the individual level (Trzesniewski & Donnellan, 2010; Twenge & Campbell, 2010).

Results

Table 1 shows the loneliness means and citations for each study used in this analysis. We correlated year with loneliness, weighted by sample size. A decline in loneliness was observed, $r(46) = -.30$, 95% CI [-.54, -.02], $p = .039$, $k = 48$, $N = 13{,}041$. Contemporary college students reported lower loneliness than earlier counterparts did. A scatterplot of loneliness means by year is shown in Figure 1, in which two outliers are apparent. The outliers were 4.63 and 3.03 standard deviations above the mean, although both had Mahalanobis distances below 2.50, suggesting they were not multivariate outliers. Removing the outliers increased the effect size, but we focused on conservative estimate and included outliers for all calculations.[2] Figure 1 suggested a curvilinear relationship, and to investigate this possibility, we centered and squared the year variable and entered it into a regression with the linear term. This variable did not predict loneliness, $\beta = -.26$, $t = -1.91$, $p = .063$, $k = 48$, $N = 13{,}041$.

Table 1
Mean Loneliness Levels with the Date of Collection

				Males			Females			
Date Collected	n	Mean	SD	n	M	SD	n	M	SD	Source
1978	162	33.14		64	36.23		98	31.12		Russell, Peplau and Cutrona (1980) Study 1
1978	230	36.5	10.46	102	37.06	10.91	128	36.06	10.11	Russell, Peplau and Cutrona (1980) Study 2
1979	96	34.96 [a]		54			42			Cheek and Busch (1981)
1981	493	37.22	9.22	285			208			Austin (1983)
1981	42	37 [b]		20	33.8 [b]		22	39.9 [b]		Williams and Solano (1983)
1981	485	38.15 [b]	9.83 [b]	215	39.76 [b]	10.13 [b]	270	36.87 [b]	9.6 [b]	Russell, Curtrona, Rose and Yurko (1984)
1981	93	34.83 [a, b]		43	36.64 [a, b]		53	33.36 [a, b]		Wheeler, Reis and Nezlek (1983)
1982	60	39	10	60	39	10	0			Sloan and Solano (1984)
1984	290	37.42	8.74	143			147			Finn and Gorr (1988)
1984	69	37.34 [a, b]	8.55 [a, b]	37	39.96 [a, b]	10.16 [a, b]	32	34.32 [a, b]	6.68 [a, b]	Wittenberg and Reis (1986)
1985	180	39.56	8.53							Hays and Dimatteo (1987)
1985	160	41.05 [b]	10.47 [b]							Spitzberg and Hurt (1987)

1986	53	37.63	9.85	26			27			Kobak and Sceery (1988)
1987	305	35.37	8.93	112	37.50	9.73	193	34.4	8.46	Davis and Kraus (1989)
1987	236	36.04	8.67	85	37.08		151	35.45		Hoglund and Collision (1989)
1987	325	37.2[b]		144			181			Solano and Koester (1989) Study 1
1987	321	34.6[b]		168			153			Solano and Koester (1989) Study 2
1988	51	35.45[b]	8.95[b]	22	37.31[b]	9.42[b]	29	34[b]	8.59[b]	Burger (1995) Study 3
1988	164	44.15[a]		79	45.28[a]		85	43.09[a]		Jones, Bloys and Wood (1990)
1989	293	37.14	9.5	146	37.90	10.1	147	36.4	8.9	Jackson and Cochran (1991)
1989	244	38.92	9.86	79			145			Gurtman (1991)
1989	144	35.87[b]	8.68[b]	144	35.87[b]	8.6[b]	0			Frankel and Prenticedunn (1990)
1990	279	39.88	10.45							Gurtman (1993)
1990	55	38.83	8.85							Booth, Bartlett and Bohnsack (1992)
1990	60	35.9	7.34							Damsteegt (1992)
1990	375	37.19[b]	8.42[b]	170	38.33[b]	9.39[b]	205	36.24[b]	7.61[b]	Overholser (1992)
1991	625	36.69		288			337			Anderson, Miller, Riger, Dill and Sedikides (1994) Study 1
1991	282	39.07		127			155			Anderson, Miller,

										Riger, Dill, & Sedikides (1994) Study 2
1991	194	47.65[e]	8.9	133			63			Canary and Spitzberg (1993)
1991	323	37.29[b]	8.55[b]	148	38.175[b]	9.23[b]	175	36.54[b]	7.97[b]	Overholser (1993)
1992	202	36.97	10.08	85			117			Barber and Stoltennberg (1994)
1992	200	35.3	9.34	63	37.51	9.43	137	34.29	9.3	Gladstone and Koenig (1994)
1993	172	26.4[a]	12	90			82			Joiner (1997)
1995	69	37.6	9.4	42			27			Mahon, Yarcheski and Yarcheski (1997)
1995	208	39.73[b]	7.79[b]	76	39.61[b]	8.03[b]	132	39.8[b]	7.68[b]	Christensen and Kashy (1998)
1995	251	34.36[b]	9.8[b]	91			160			Ponzetti and James (1997)
1997	184	34.99[a, b]	9.4[a, b]	61	37.8[a, b]	10.6[a, b]	123	33.6[a, b]	8.8[a, b]	Kirkpatrick, Shillito and Kellas (1999)
1998	366	38.5	11.41	174	44.69[e]	12.61	192	37.1	10.32	Lee and Robins (2000)
1999	100	37.53	11.09	49			48			Lee, Draper and Lee (2001) Study 2
1999	124	35.23	10.39	54	38.09	10.85	70	33.03	10.39	Johnson, LaVoie and Mahoney (2001)
2000	39	34.38	9.51							Shaw and Gant (2002a)
2000	38	34.24	9.36	11	34.18	9.47	27	34.26	9.31	Shaw and Gant

										(2002b)
2001	277	38.35	8.51	150			127			Morahan-Martin and Schumacher (2003)
2001	300	36.5 [b]	10.2 [b]							Montgomery, Haemmerlie and Ray (2003)
2002	292	38.46	10.35	75			217			Chapman and Hayslip (2005)
2002	519	38.4	10.7	135			384			Baumeister and Storch (2004)
2002	404	35.42 [a, b]	10.22 [a, b]	158	37 [a, b]	10.32 [a, b]	246	34.4 [a, b]	10.16 [a, b]	Mattanah, Hancock and Brand (2004)
2003	2513	34.86 [b]	10.61 [b]	1198	37.65 [b]	11.14 [b]	1315	32.32 [b]	10.14 [b]	Hawkley, Browne and Cacioppo (2005)
2003	157	36.16 [a]	11.46 [a]	41			116			Elliot, Gable and Mapes (2006)
2004	75	34.5 [b]	9.16 [b]	26			49			Pruzan and Isaacowitz (2006)
2004	350	40.4 [a]	9.8 [a]	126			224			Mounts, Valentiner, Anderson and Boswell (2006)
2005	312	44.4 [a]	10.8 [a]	103			209			Gordon, Juang and Syed (2007)
2006	383	34.47	11.18	117			266			Chang, Hirsch, Sanna, Jeglic and Fabian (2008)
2007	450	33.63	9.92	333			117			Taliaferro, Rienzo, Miller, Pigg and Dodd (2010)

2007	63	31.2 [a]	12.57 [a]	13			50			Hicks and King(2009) Study 2
2007	73	34.08 [a]	8.96 [a]	29	32.16 [a]		44	35.36 [a]		Tsai and Reis (2009)
2008	121	43.88[d]	9.22							Chang, Hirsh, Sanna, Jeglic and Fabian (2011)
2009	93	22.3[c]	12.4							Valentiner, Mounts, Dunk and Gier-Lonsway (2011)
2009	91	32.6	7.76	38			53			Ong, Rothstein and Uchino (2012)
2009	114	35.35 [b]	10.18 [b]	51	35.8 [b]	9.9 [b]	63	35 [b]	10.4 [b]	Lawler-Row, Hyatt-Edwards, Wuensch and Karremans (2011)
2009	40	36.44 [b]		20			20			Norman et al (2011)

[a] Mean adjusted to the original 1-4 summed scoring. [b] Data obtained through email correspondence. [c] This data was excluded from our analyses as a mean of 22.3 is implausibly close to the minimum of the scale which is 20. Furthermore, if the scale was scored differently than reported in the article, this would qualify it for exclusion as well. [d] The scatter-plot suggests this mean as an outlier. The sample was exclusively Latino/a. Being part of a minority may increase loneliness. Latino/a people did have a higher level of loneliness in Study 2. [e] The scatter-plot of suggests this mean as an outlier.

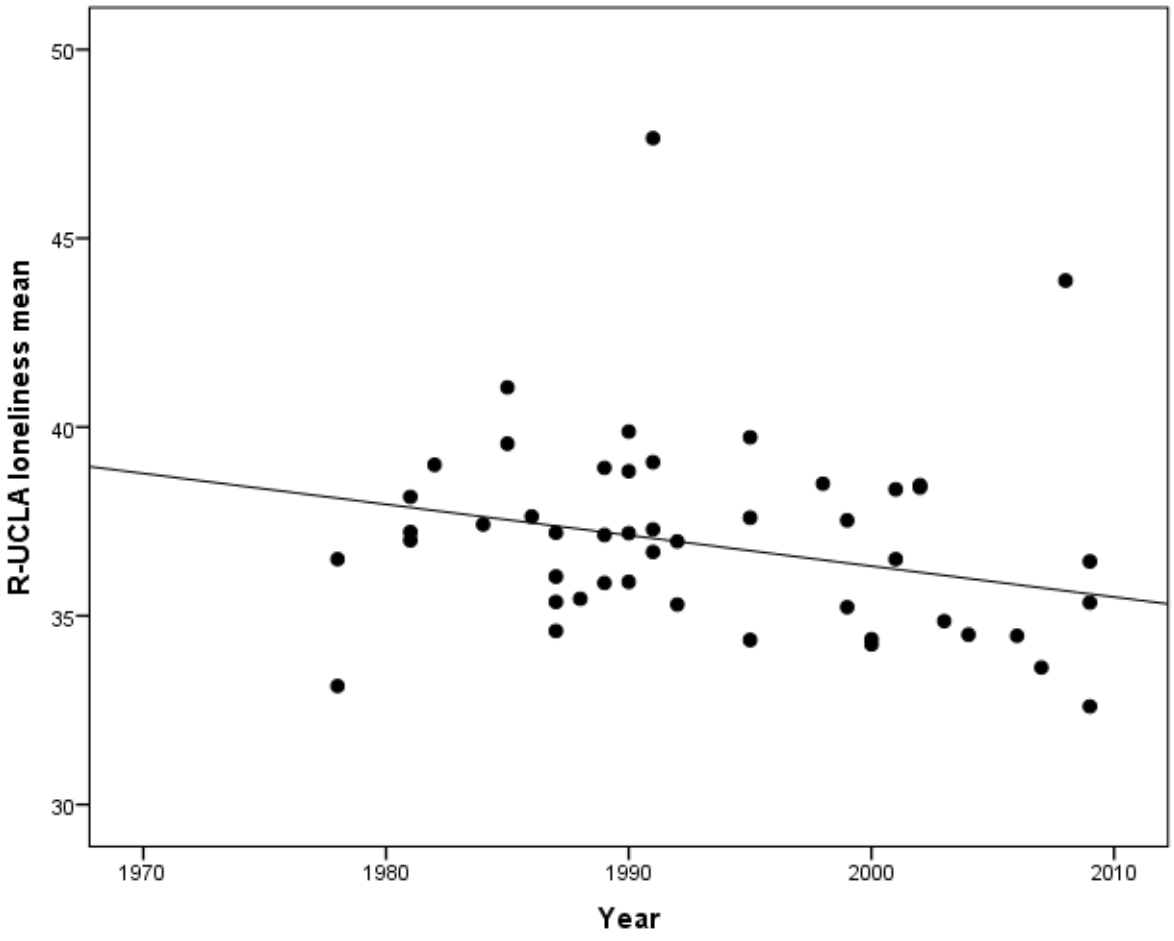

Figure 1. Scatter-plot of loneliness means by year. Only studies using the original scaling are included. Regression line reflects weighting by n.

We calculated effect size by comparing predicted 1978 and 2009 means. We used a regression equation (*B* = -0.082, constant = 199.989) to calculate means of 37.793 and 35.251 for 1978 and 2009, respectively. We used the average standard deviation of 9.85 to obtain an effect size estimate, *d* = -0.26, a modest value that was smaller than those reported in other cross-temporal meta-analyses, including empathy (*d* = -0.65, for the empathic concern subscale; *d* = -0.44, for the perspective taking subscale), extraversion (*d* = 0.80), and self-esteem (*d* = 0.30; Gentile et al., 2010; Konrath et al., 2011; Twenge, 2001a). The 95% confidence intervals for the *B* weights ranged from -.160 to -.004, with *d* scores from -.55 to -.01

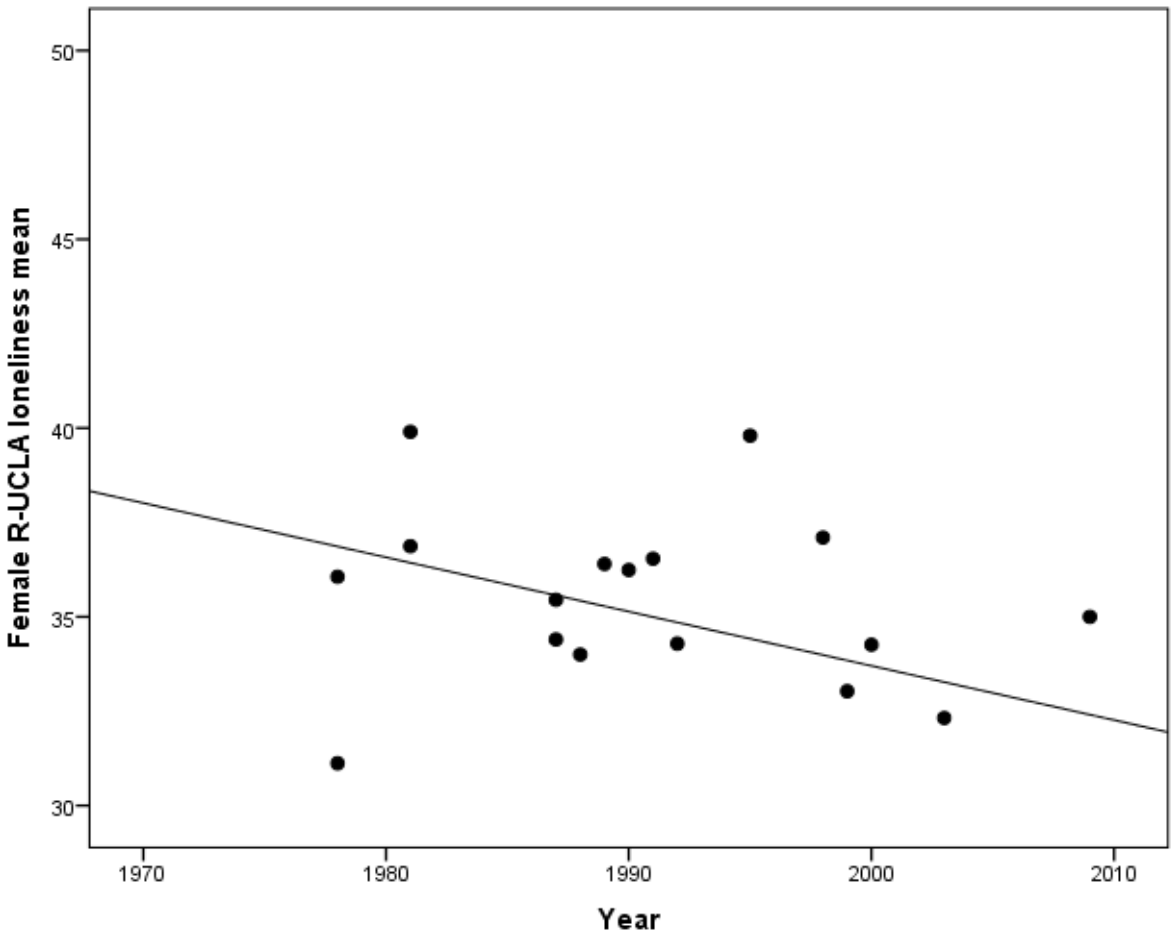

Figure 2. Scatterplot of female loneliness means by year. Only studies using the original scaling are included. Regression line reflects weighting by n.

We examined gender differences over time using studies that report male and female loneliness scores separately (Figures 2 and 3). Seventeen studies reported female and 19 studies reported male levels of loneliness. Women showed a large decline in loneliness, $r(15) = -.53$, 95% CI [-.81, -.07], $p = .027$, $k = 17$, $N = 3{,}354$, and men showed no change, $r(17) = .00$, [-.45, .45], $p = 1.000$, $k = 19$, $N = 2{,}915$).[3] We used a Fisher transformation to compare male and female declines, and the difference between correlations was non-significant, $z = 1.61$, $p = .107$. We examined differences between men and women regarding R-UCLA loneliness scores using a standardized, mean-difference technique from Lipsey and Wilson (2001); men reported higher levels of loneliness ($M = 38.15$, $SD = 10.49$) than women ($M = 34.49$, $SD = 9.49$, $d = 0.37$, [0.33, 0.40]).

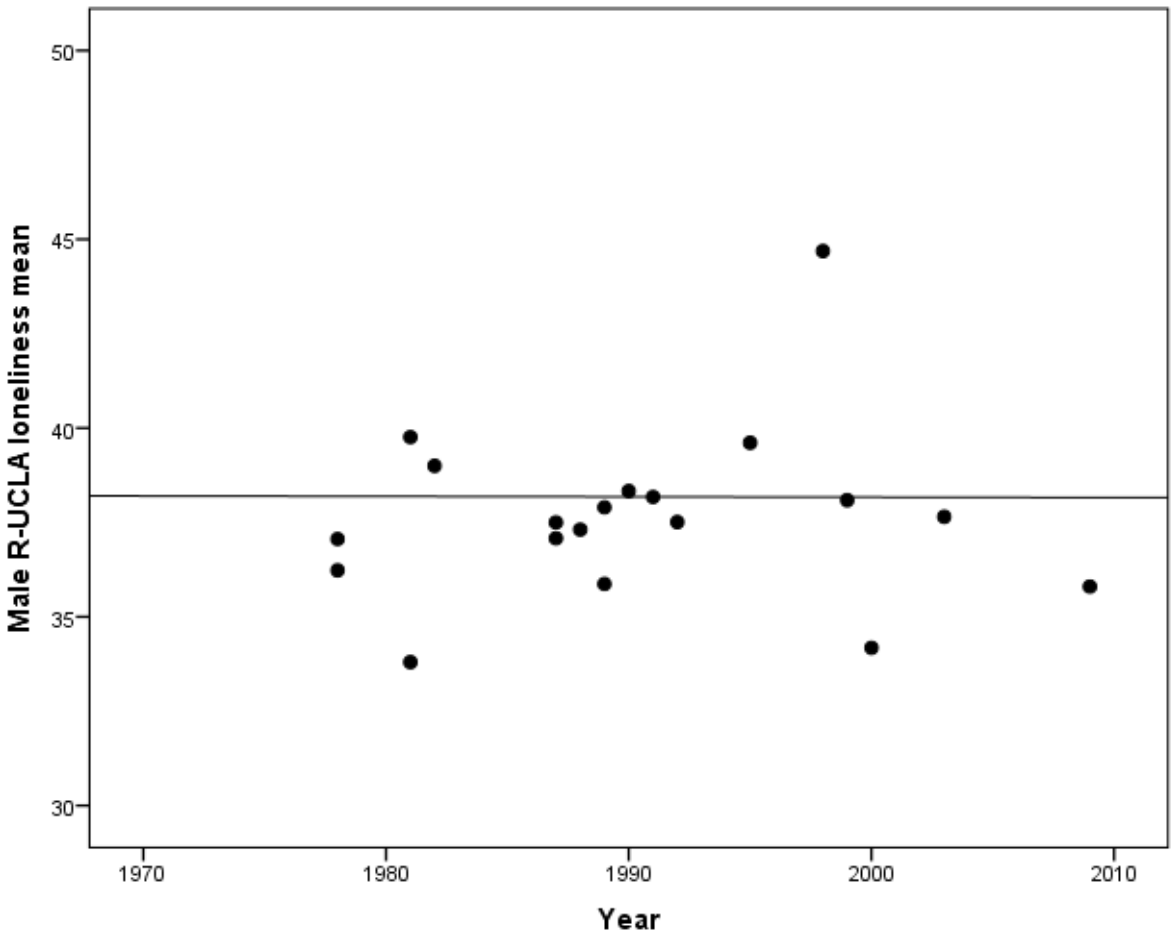

Figure 3. Scatterplot of male loneliness means by year. Only studies using the original scaling are included. Regression line reflects weighting by n.

Discussion

We examined American college students' loneliness over time using a cross-temporal meta-analysis, finding a modest, linear decline in loneliness between 1978 and 2009. A limited sample meant the confidence interval ranged from a large to a trivial decline. However, even a trivial decline in loneliness contrasts with the large decline in sociability, measured with multiple indictors such as joining clubs, going to church, voting, and having dinner guests (Putnam, 2000). We also found that across all periods, female college students reported lower loneliness than male college students did. A strength of this study derives from the validity of the R-UCLA scale, which predicts many health outcomes (e.g. Hackett, Hamer, Endrighi, Brydon, & Steptoe, 2012). Previous research on changes in social-connection often used single items without established validity, and relied on face-to-face interviews, a method vulnerable to social desirability (e.g. McPherson et al., 2006). Social desirability is especially problematic because of the stigma associated with loneliness (Lau & Gruen, 1992). The present analyses used studies that typically administered anonymous surveys, reducing social desirability pressure.

Study 1 included limitations. Study 1 used a small number of studies, limiting the reliability of the results. This problem was exacerbated when examining gender as a moderator of declines in loneliness because calculations were based on a smaller number of studies that reported means for gender separately. Study 1 did not use a representative sample, limiting the external validity of our findings. College students are more likely to be adept at using the internet, suggesting recent introductions of social media may have reduced loneliness in college students without benefiting the broader public. Loneliness may have declined because less lonely people are more prevalent in college in recent years, resulting from a change in college demographics. This concern is unlikely because demographic changes among college students are often overestimated or nonlinear (Twenge, 2001b). A nonlinear relationship appears in the median parental income of college students, a relationship consisting of rapidly rising income during the early 1980s and stability in the late 1980s (Dey, Astin, & Korn, 1991). The racial composition of American colleges is changing. In 1981, White, non-Hispanic Americans earned 86% of Bachelor's degrees; in 2007, the same group earned 72% of Bachelor's degree (U.S. Census Bureau, 2007). Despite increases in minorities, American college students remain predominantly White, non-Hispanic Americans. Minorities are unlikely to experience lower loneliness than White Americans, driving declines in loneliness. Another demographic change is the increase in women attending college. In 1975, 44% of college degrees were awarded to women; in 2007, 59% of degrees were awarded to women (U.S. Census Bureau, 2010). We found that female college students experienced lower loneliness than male college students did, so increasing numbers of women in college may explain declines in loneliness. However, we also found declines in loneliness in female samples, suggesting increasing the proportion of women does not explain declines in loneliness. Study 1 suggests a decline in loneliness among American college students, but it is unclear whether results generalize beyond college students.

Study 2

Addressing concerns regarding the representativeness of the sample in Study 1, Study 2 used a representative sample of high school students. Unlike college samples, high school samples have stable gender compositions. Although a high school sample may include other demographic changes (e.g., changes in ethnic composition), such changes reflect demographic changes in America broadly. A representative sample of high school students was available from the Monitoring the Future (MTF) project (Johnston, Bachman, O'Malley, & Schulenberg, 2012b). The project began in 1975, surveying the behaviors, attitudes, and values of Grade 12 American high school students (see http://www.monitoringthefuture.org, for more information). The sample is representative of public- and private-school students in the 48 contiguous states. The MTF project began collecting loneliness data in 1977, and data from Grade 8 and 10 in 1991.

Using data from the MTF project, Trzesniewski and Donnellan (2010) reported slight declines in loneliness from 1977 to 2006. They used only Grade 12 data, which is less representative than the data from Grade 8 and 10 because Grade 12 has higher dropout rates than Grade 8 and 10. Approximately 11% to 20% of students drop out by Grade 12 (Johnston et al., 2012b), whereas fewer than 5% of students drop out by Grade 10 and fewer than 2% of students drop out by Grade 8 (Johnston, Bachman, O'Malley, & Schulenberg, 2012a). Trzesneiwki and Donnelan did not focus on loneliness, but instead on overall decline, without examining moderators such as race because they examined a variety of constructs, including cynicism, trust, egoism, self-enhancement, individualism, and self-esteem. We analyzed the MTF data to determine whether declines in loneliness generalize beyond college students, and to explore whether gender, race, or grade moderates the decline.

Method

Participants. The MTF survey used three-stage sampling. During stage 1, staff members selected locations, during stage 2, they selected schools, and during stage 3, they selected students. Procedures ensured that the probability of drawing a school was proportionate to the number of students in the schools' 8th, 10th, and 12th Grade classes. In rare cases when a school refused to participate, staff found a school as similar as possible in terms of region, size, and population density near the same location. The project surveyed up to 350 students in each school, and selected participants randomly or in a manner that staff members judged unbiased. In schools with fewer than 350 students in their 8th, 10th, or 12th Grade classes, all students were asked to participate. The project assigned each student a sampling weight to account for differences in sample sizes among schools, and to account for earlier selection probabilities. We used this sample weight during all calculations, unless otherwise specified.

The entire sample consisted of 326,432 students. Most analyses we report are based on data from 1991, which consisted of 285,153 students—133,854 males (47%), 145,810 females (51%), and 5,489 students of unknown gender (2%). The greater proportion of females is probably due to higher dropout rates among Black males (Johnston et al., 2012b). The racial composition of the sample changed over time. From 1977 to 2012, the proportion of Black students was stable at approximately 11%, the proportion of White students decreased from approximately 80% to 60%, the proportion of Hispanic students increased substantially from negligible to 15%, and the proportion students of other races increased from below 8% to over 17%. The proportion of female students varied from 54% to 50% across the years. Response rates were stable. For Grade 12, from 1977 to 2012, response rates ranged from 79% to 85%. For Grade 8, from 1991 to 2012, response rates ranged from 87% to 91%. For Grade 10, from 1991 to 2012, response rates ranged from 85%

to 89%. These response rates suggest changes in responses over time are unlikely due to changes in response rates (Johnston et al., 2012b).

Procedure

Survey Research Centre representatives and their assistants, who followed a standardized procedure, administered the MTF survey. Students completed surveys in classes during normal class periods, although the surveys were administered in larger groups in some schools. Testing took approximately 45 minutes. Students in Grade 12 were allocated randomly to complete one of six surveys. Survey 5 contained loneliness items, which were in the same location in the surveys from 1977 to 2012. Students in Grade 8 and 10 were allocated randomly to complete one of four surveys. For Grades 8 and 10, loneliness items appeared in the same place on Survey 1 from 1991 to 2004 and on Survey 3 from 1997 to 2012. Thus, loneliness items appeared on both Surveys 1 and 3 from 1997 to 2004. Loneliness was measured using 6 items (see Table 2), and responses were reported using a scale ranging from 1 (*disagree*) to 5 (a*gree*).[4]

Results

Analytic approach. To examine changes in loneliness over time, we used the same type of analysis as Study 1, except this study used individual data. We report correlations between year and loneliness level, and use the same method as Study 1 to compute *d* effect sizes. Unless stated otherwise, we report results from 1991 to 2012 so we can compare results from all grades. Loneliness items were included for Grades 8 and 10 on both Survey 1 and 3 from 1997 to 2004. We found that loneliness levels were the same for both surveys. For Grade 8, loneliness levels were the same for Survey 1 (M = 2.18, SD = 0.81) and Survey 3 (M = 2.19, SD = 0.81), $t(51169) = -1.52$, $p = .127$. For Grade 10, loneliness levels were the same in Survey 1 (M = 2.19, SD = 0.79) and Survey 3 (M= 2.20, SD = 0.79), $t(58452) = -1.51$, $p = .131$). We combined data from these surveys for all subsequent analyses.

Table 2

MTF Items with Level of Change Over Time, Communalities, and Factor Loadings Based on Direct Oblimin Rotation.

Item	$d_{1991-2012}$	95% CI	Communality	Social Network Isolation	Subjective Isolation
1. A lot of the times, I feel lonely	-0.14	[-0.14, -0.12]	.50	-.08	**.69**
3. I often feel left out of things	-0.06	[-0.07, -0.05]	.65	-.01	**.81**
5. I often wish I had more good friends	-0.27	[-0.28, -0.26]	.30	.06	**.56**
2. There is always someone I can turn to if I need help[a]	0.04	[0.04, 0.05]	.71	**.83**	-.06
4. There is usually someone I can talk to if I need to[a]	-0.05	[-0.05, -0.04]	.78	**.88**	.00
6. I usually have a few good friends around I can get together with[a]	0.14	[0.13, 0.16]	.21	**.46**	.03

Note. Factor loadings > .40 are in boldface.

[a] These items were reversed before calculations of the changes over time.

Racial, gender, and grade differences. We examined racial, gender, and grade differences in loneliness. Males (M = 2.21, SD = 0.78) did not differ from females (M = 2.22, SD = 0.80) in reported loneliness, t(278475.48) = -1.33, p = .184. Grades differed in their level of loneliness, F(2, 285149) = 104.31, p < .001. We used Bonferroni corrections and found Grade 12 students (M = 2.26, SD = 0.78) reported slightly higher loneliness than Grade 10 students (M = 2.21, SD = 0.78, d = 0.06, p <.001), who reported nearly the same loneliness as Grade 8 students (M = 2.20, SD = 0.80, d = 0.01, p = .045). From 2005 onward, the MTF project recorded the proportion of Hispanic students in samples. We used these data, and found that loneliness differed among ethnicities, F(3, 60455) = 96.00, p <.001. Using Bonferroni correction, we found that White students (M = 2.14, SD = 0.79) reported lower loneliness than Black students (M = 2.23, SD = 0.80, d = -0.11, p <.001), Hispanic students (M = 2.21, SD = 0.80, d = -0.09, p < .001), and students of other or missing race (M = 2.29, SD = 0.83, d = -0.19, p < .001). Hispanic students reported loneliness levels that were not significantly different from Black students (p = .430). Students of other or missing race reported higher loneliness than Black (d = 0.07, p < .001) or Hispanic students (d = 0.10, p < .001).

Changes to loneliness over time. High school students reported declining loneliness from 1991 to 2012 (see Table 2). We examined a possible curvilinear relationship by centering and squaring the year variable. The variable predicted loneliness ($\beta = .018$, $t = 9.16$, $p < .001$), but did not predict more variance than the linear relationship ($\beta = -.038$, $t = -18.94$, $p < .001$), so we focused on the simpler, linear relationship. Figure 4 shows mean loneliness by year. We split results by grade because Grade 12 means were available for a greater period, allowing us to assess trends for that grade over more time. Figure 4 shows a somewhat erratic, although generally linear, decline over time. Grade 10 students reported spikes in loneliness during periods 1992 to 1994 and 2001 to 2006.

Table 3

Declines in Loneliness by Grade, Gender, and Race

Group	*r*	95% CI	*b*	95% CI	*d*	95% CI
1991-2012						
Overall	-.03	[-.04, -.03]	-0.004	[-0.005, -0.004]	-0.11	[-0.14, -0.11]
Black	-.04	[-.05, -.03]	-0.006	[-0.007, -0.004]	-0.17	[-0.19, -0.11]
White	-.04	[-.04, -.03]	-0.005	[-0.005, -0.004]	-0.14	[-0.14, -0.11]
Men	-.03	[-.04, -.03]	-0.004	[-0.005, -0.003]	-0.11	[-0.14, -0.08]
Women	-.03	[-.04, -.03]	-0.004	[-0.005, -0.003]	-0.11	[-0.14, -0.08]
Grade8						
Overall	-.04	[-.04, -.03]	-0.005	[-0.006, -0.004]	-0.14	[-0.17, -0.11]
Black	-.03	[-.05, -.02]	-0.004	[-0.007, -0.002]	-0.11	[-0.19, -0.06]
White	-.05	[-.06, -.04]	-0.007	[-0.008, -0.006]	-0.19	[-0.22, -0.17]
Men	-.04	[-.05, -.03]	-0.005	[-0.006, -0.004]	-0.14	[-0.17, -0.11]
Women	-.03	[-.04, -.02]	-0.005	[-0.006, -0.003]	-0.14	[-0.17, -0.08]
Grade 10						
Overall	-.03	[-.04, -.03]	-0.004	[-0.005, -0.004]	-0.11	[-0.14, -0.11]
Black	-.05	[-.07, -.04]	-0.007	[-0.010, -0.005]	-0.19	[-0.28, -0.14]
White	-.03	[-.04, -.03]	-0.004	[-0.005, -0.004]	-0.11	[-0.14, -0.11]
Men	-.03	[-.04, -.02]	-0.004	[-0.005, -0.003]	-0.11	[-0.14, -0.08]
Women	-.03	[-.04, -.03]	-0.005	[-0.006, -0.003]	-0.14	[-0.17, -0.08]
Grade 12						
Overall	-.04	[-.05, -.03]	-0.005	[-0.006, -0.004]	-0.14	[-0.17, -0.11]
Black	-.04	[-.07, -.01]	-0.005	[-0.008, -0.002]	-0.14	[-0.22, -0.06]
White	-.04	[-.05, -.03]	-0.005	[-0.006, -0.003]	-0.14	[-0.17, -0.08]
Men	-.04	[-.05, -.02]	-0.004	[-0.006, -0.003]	-0.11	[-0.17, -0.08]
Women	-.04	[-.05, -.03]	-0.005	[-0.006, -0.003]	-0.14	[-0.17, -0.08]

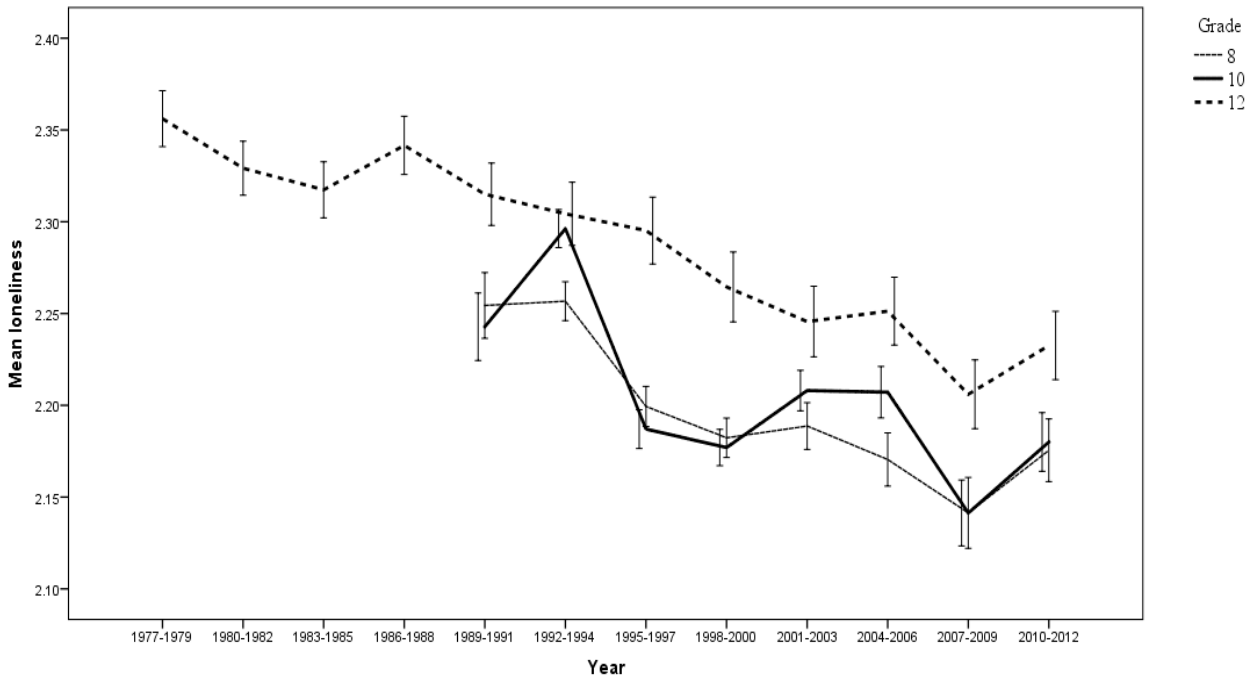

Figure 4. Mean level of loneliness for high school students over time, split by grade. Error bars represent 95% confidence intervals. Cases are weighted by the MTF weighting variable.

We examined differences in the decline in loneliness between grades, genders, and races. There was an interaction between year, gender, and grade, F (42, 292769) = 2.27, $p < .001$. Using data from only White and Black students, we found an interaction between year, race, and grade, F (42, 226304) = 2.09, $p < .001$. These interactions reflect the large power available in this study because the decline was similar between genders, races, and grades, as shown in Table 3, which shows the decline in loneliness separately for grades, genders, and races. We focused on confidence intervals of *d* values because they are the clearest estimate of effect sizes. Most groups of races, genders, and grades produced confidence intervals that overlapped with the confidence interval of the overall sample. An exception was Grade 8 White students, who showed greater declines than the overall sample. Another exception was Grade 10 Black students, who produced a confidence interval that overlapped slightly with the overall sample. Most of the likely Grade 10 Black students' declines were higher than the likely declines of the overall sample. All confidence intervals split by gender showed at least a modest overlap with the overall confidence interval. Despite minor differences, declines were similar across grades, races, and genders.

Aspects of loneliness. We examined specific MTF items to test whether various aspects of loneliness demonstrated differing trends. Table 2 shows change over time for each loneliness item. Items had larger standard deviations than the standard deviation of the overall scale, causing

estimates of change over time to be smaller than that for the overall scale. Table 2 shows that various items demonstrated different rates of change. Four items showed decreases, and two items showed increases in loneliness. To understand the changes of these items, we conducted an exploratory factor analysis. We performed a common factor rather than a principal component analysis because we were interested in the underlying structure of the scale rather than dimension reduction (Floyd & Widaman, 1995). The factor analysis resulted in two factors, based on both the scree plot and the fact that only two factors had eigenvalues above one. We used a direct oblimin, oblique rotation because the factors correlated (r = -.14).

Table 2 shows both the communalities and the factor loading of the items, and that items assessing feeling lonely, feeling left out, and desiring more close friends loaded on one factor. Two of these items assessed feelings and one assessed desire. All appeared to assess subjective feelings of isolation, so we labelled the factor "Subjective Isolation." Table 2 shows that items assessing having friends to talk to, turn to, and interact with loaded on one factor. These items measured students' social environments, tapping social networks and social support, so we labelled the factor "Social Network Isolation". The two factors separated into positively worded and negatively worded items, which parallels results from factors analysis of the UCLA loneliness scale and suggests that the factors may be method factors (Russell, 1996). Both Subjective Isolation (α = .72) and Social Network Isolation (α = .76) had adequate reliability. We computed scores for both constructs by averaging the three items that loaded on each factor. We did not use factor loadings to compute factors because loadings can be unstable across samples. We scored both factors so higher scores indicated greater loneliness.

We examined differences in the factors over time. The two factors showed diverging temporal trends. From 1991 to 2012, Subjective Isolation declined, r(285151) = -.06, 95% CI [-.06, -.05], p < .001, d = -0.20, [-0.22, -0.18], and all items loading on subjective isolation also declined (see Table 2). These items indicated high school students reported feeling less lonely, feeling less left out, and desiring friends less. From 1991 to 2012, Social Network Isolation increased, r(285151) = .02, [.01, .02], p < .001, d = 0.06, [0.04, 0.06]). Items 2 and 6 loaded on social network isolation and demonstrated small increases over time (see Table 2). These items indicated high school study reported declines in having someone to turn to and having friends with whom to interact. Item 4 loaded on social network isolation but showed a slight decline. Item 4 indicated that students reported increasing likelihood that they have someone to talk to. Disparities between temporal patterns of the two factors are clearest in the contrast between Items 6 and 5. Item 6 showed that high school students had fewer friends with whom to "get together with" whereas Item 5 shows declines in their desire for more friends, suggesting a contrast between subjective experiences and social environments.

Discussion

Results from Study 2 mirrored results from Study 1, finding declines in loneliness over time. Although Study 1 was based on a moderate number of studies, limiting reliability, Study 2 was based on a very large number of participants, increasing reliability of the findings. Study 2 found that the decline among White students from 1991 to 2012 was d = -.14, which extrapolated to the same period as Study 1 equates to d = -0.21, slightly lower than the overall effect (d = -0.26) found in Study 1. The r values were very different between Study 1 and 2 because Study 1 correlated year with loneliness means of overall studies whereas Study 2 correlated year with individual loneliness scores. There was substantially more variation in individual scores than group means, inflating correlations based on group means. Interpreting d scores addressed this issue because those scores were unaffected by the reduction in variability (Trzesniewski & Donnellan, 2010; Twenge & Campbell, 2010).

Study 2 found White students reported lower loneliness than Black students, Hispanic students, or students of other races. Black and Hispanic students were more likely to drop out of high school (Johnston et al., 2012b), meaning loneliness may have been underestimated for these groups. High loneliness among minorities may reflect prejudice they experience (Dovidio, Kawakami, & Gaertner, 2002). Students who reported "other" races experienced the highest loneliness, and their proportions expanded greatly over time. This increasing proportion reduced overall decline of loneliness, explaining why rates of decline for White and Black students were higher than overall declines. Declines in loneliness were similar across races, although Grade 8 White Students and Grade 10 Black students reported greater declines in loneliness.

Study 2 found that the trend of loneliness includes diverging elements; two factors emerged from the factor analysis, and these factors demonstrated diverging temporal trends. One factor, subjective isolation, measured the students' rating of loneliness and desire for more friends. The other factor, social network isolation, measured the students' ratings of their social network such as having friends with whom to interact. Subjective isolation declined, but social network isolation increased, suggesting high school students perceived less loneliness but poorer social networks. The contrast between feeling lonely and poorer social networks was made clearer by comparing temporal trends of the items. Item 6 showed high school students reported fewer friends with whom to interact over time, but Item 5 suggested less desire for more friends over time.

General Discussion

We found declines in loneliness over time. Study 1 suggests a decline in loneliness among American college students, and study 2 generalizes results to a representative sample of high school students, providing converging evidence that loneliness declined over time. This decline contrasts with the idea that society is becoming increasingly lonely, an idea present in both popular media

(Fountain, 2006, July 2) and research (Kanai et al., 2012). The contrast may be due to negativity bias, a bias that causes negative events to appear more negative the closer events are to the present (Rozin & Royzman, 2001). People may imagine examples of isolation in the present easily but forget examples from the past. People may idealize the past, focusing on aspects of loneliness that are increasing, and overlook aspects of loneliness that are decreasing. Study 2 reveals that aspects of loneliness show varying trends. Subjective isolation deceased, reflecting declines in experiences of loneliness. In contrast, social network isolation increased, reflecting declines in perceived interactions and support from friends. Particularly striking were trends for two items that suggested high school students reported fewer friends with whom to interact, but less desire for more friends.

Trends of loneliness occurred in the context of many other cultural changes that could influence loneliness. Over time, extraversion and self-esteem increased substantially (Gentile et al., 2010; Twenge, 2001a), and both correlate strongly with lower loneliness (Civitci & Civitci, 2009; Saklofske & Yackulic, 1989). Another cultural trend is that society is more accepting, a trend suggested by declines in violence and discrimination (Pinker, 2011). One trend is the emergence of social media, and although social media can reduce feelings of loneliness (Deters & Mehl, 2013), social media is unlikely a factor because social media became prominent recently and after declines in loneliness began. Not all cultural trends point to lower loneliness. Empathy and secure attachments declined, and insecure attachments increased (Konrath et al., 2014; Konrath et al., 2011). High insecure attachments, low empathy, and low secure attachments predict higher loneliness (Davis, 1983; DiTommaso et al., 2003).

Other cultural trends influence how people relate to each other, including trends toward greater independence and greater emphasis on personal success. People have become increasingly individualistic (Twenge, Campbell, & Gentile, 2012). American high school students have increased desire for expensive possessions, money, and high-paying jobs (Twenge & Kasser, 2013), and parents place less emphasis on raising obedient children (Hamamura, 2012). People are more likely to describe themselves using masculine traits such as “independent” and “assertive” (Twenge, 1997), and recent generations rate effort as more important to success than previous generations did (Hamamura, 2012). Each of these cultural trends likely influences and is influenced by the others, resulting in dynamic, reciprocal relationships. Identifying which cultural trends precede the others is difficult.

Modernization elucidates various cultural changes because it produces parallel cultural changes in diverse and scattered cultures. A clear example of modernization is the vast majority of cultures demonstrating trends toward fewer children per women, a trend observed despite those cultures having vastly different circumstances and histories (Newson, Postmes, Lea, & Webley, 2005). Modernization includes a broad range of factors such as rising mobility, urbanization,

divorce, economic output, and labor specialization, and declining contact with kin (Hamamura, 2012; Newson et al., 2005; Putnam, 2000). These trends can influence how people relate to each other. Greater economic opportunities offer individuals more latitude to manage their own money, decide whom to date, and decide whom to marry, reducing the influence of kin and giving people more autonomy, which may increase individualism (Hamamura, 2012). As jobs become more specialized, workers are required to possess more specialized training, driving increases in achievement-orientated mindsets (Hamamura, 2012). Economic changes lead to increased individuality, which could lead to decreasing interest in friends, increasing self-reliance, increasing self-esteem, and decreasing loneliness. These explanations are speculative, requiring evidence from future research.

Future Research

Because of the complexity of societal trends, more research is needed before an adequate explanation of various cultural trends is reached. Future research should explore whether other cultures demonstrate similar changes found in the United States regarding loneliness. If modernization is responsible for the changes, similar changes should be evident across diverse cultures. Some research in this area has been conducted. One cross-cultural study found increases in individualism in both Japan and the United States, pointing to similar modernization factors in the two countries, including increasing urban population, decreasing family size, and increasing divorce (Hamamura, 2012). Although the study found similar patterns between the two countries, the study also found diverging trends, most notably a decline in trust in the United States but not in Japan. A similar analysis for loneliness may identify whether the decrease in subjective isolation and increase in social network isolation occurs in other cultures, indicating changes result from modernization, or are specific to the United States, indicating changes result from unique features of American culture. Future research should also examine whether the results generalise beyond high school and college students within the United States. The result of the current study may be due to cohort effects that are only affecting younger people but not older people.

Future research should examine changes in relationship quality, a construct at least as important to social well-being as frequency of social activities (Cacioppo & Patrick, 2008; Reis et al., 1985), yet little research examines changes over time regarding relationship quality. Data on changes to relationship quality are necessary for a complete understanding of changes in loneliness. Measures of relationship quality such as relationship satisfaction and social support correlate negatively with loneliness, and may be changing over time (Sarason, Sarason, Shearin, & Pierce, 1987; Segrin, Powell, Givertz, & Brackin, 2003). Higher relationship quality could account for reduced loneliness despite reduced social contact.

Conclusion

Loneliness declined over time. Although the decline in loneliness is small, it contrasts sharply with expectations of large increases in loneliness, expectations found in both in the public (Fountain, 2006, July 2) and in the literature (Kanai et al., 2012). The decline demonstrated diverging trends. Over time, high school students reported less subjective isolation but more social network isolation. These trends occurred in the context of many other cultural trends such as increasing extraversion, increasing self-esteem, decreasing secure attachment, and decreasing empathy. Understanding the complex nature of these cultures trends requires further research, and examining whether these cultural trends are similar outside of the United States would suggest whether the trends result from broad factors of modernization or unique facets of American culture.

Footnotes

[1]Gentile et al (2010) analyzed scores on the Rosenberg Self-Esteem scale and found an increase in self-esteem for studies using the 4-point scale but found no change in self-esteem for studies using the 5-point scale. They speculated that the existence of a neutral midpoint changed responses to the scale. We were unable to do the same analysis as no alternate scoring of R-UCLA scale appeared in enough studies to analyze separately. We examined whether including alternate scoring would change our results. We converted means derived from their alternate scoring to the mean using the 1-4 summed scoring with simple adjustments. For instance, if a scale was 1-5, we divided scores by 5 and then multiplied by 4. These calculations are problematic because a score of 5 converts to 4, 4 converts to 3.2, and 1 converts to 0.8, introducing a large amount of distortion. Including these scores, we found loneliness did not correlate with year of collection, $r(58) = -.15$, 95% CI [-.39, .11], $p = .268$, $k = 60$, $N = 15{,}178$.

[2]Removing the outliers in Figure 1 increased the strength of the relationship between loneliness and year, $r(44) = -.31$, 95% CI [-.55, -.02], $p = .036$, $k = 46$, $N = 12{,}724$.

[3]Removing the outlier in Figure 3 did not change the relationship between loneliness and year for males, $r(16) = -.16$, 95% CI [-.58, .33], $p = .518$, $k = 18$, $N = 2{,}741$.

[4]The MTF loneliness items lack established psychometric properties or validity. We recruited 250 participants from Amazon's Mechanical Turk to assess the validity of the MTF loneliness items. The sample consisted of 151 men (60.4%). The average age was 35.50 ($SD = 13.42$). The sample consisted of 179 Caucasians, 21 Asians, 23 Africans, and 27 people of other races. The MTF scale had adequate reliability ($\alpha = .85$) and showed a strong correlation with the R-UCLA loneliness scale, $r(248) = .86$, 95% CI [.82, .89], $p < .001$.

Chapter 3

Chapter 2 found that as sociability has decreased, loneliness has also decreased, suggesting loneliness is not strongly associated with lower sociability. However, Chapter 2 did not directly look at the relationship between sociability and loneliness. Chapter 3 addressed this gap by explicitly examining the relationship between sociability and loneliness. Chapter 3 also examines other individual differences that could explain a link between sociability and loneliness, and Chapter 3 also examines predictors of sociability. Sociability may be influenced by how one relates to the rewards and punishments of the social world. People vary in their sensitivities to reward and punishment and these individual differences are elaborated by Reinforcement Sensitivity Theory (RST). Chapter 3 examines the association between loneliness, sociability and other individual differences. Chapter 3 is taken from published work (D. M. T. Clark, Loxton, & Tobin, 2015b).

Abstract

The purpose of this paper was to use the revised Reinforcement Sensitivity Theory as a framework to understand loneliness. We expected higher loneliness to be associated with low reward sensitivity and high punishment sensitivity. We tested how reward and punishment sensitivity could affect loneliness by exploring potential mediators including shyness, sociability, communal orientation, and acceptance. We tested 370 participants using an online questionnaire. High punishment sensitivity, but not anxiety, predicted higher loneliness. This association was mediated by higher shyness and lower psychological acceptance. High reward sensitivity was associated with lower loneliness. This association was mediated by lower shyness, higher sociability, higher communal orientation, and higher acceptance. The mediated model with reward and punishment sensitivity accounted for over half the variance in loneliness. Considered in isolation, acceptance predicted over a quarter of the variance in loneliness. These results allow us to identify those at risk of loneliness and, by addressing the mediators, especially acceptance, suggest possible interventions for loneliness.

Cross-sectional Relationship Between Sociability and Loneliness

Loneliness is the subjective experience of a lack of social connection and predicts poor immune function (Pressman et al., 2005), higher stress hormones (Kiecolt-Glaser et al., 1984), suicidal ideation (Stravynski & Boyer, 2001), and depression (Cacioppo, Hughes, Waite, Hawkley, & Thisted, 2006). Loneliness may be predicted by how one relates to the rewards and punishments of the social world. People vary in their sensitivities to reward and punishment and these individual differences are elaborated by Reinforcement Sensitivity Theory (RST). Using this theory, researchers have found lonely people are low in reward sensitivity and high in punishment sensitivity (Chang, Kahle, Yu, & Hirsch, 2014). RST was substantially revised in 2000 (Gray & McNaughton, 2000) and previous measures of reward and punishment sensitivity may tap other constructs, such as anxiety, meaning the link between loneliness and reward and punishment sensitivity needs to be re-evaluated. Furthermore, it is unknown what processes mediate the relationship between RST traits and loneliness. The aim of the current paper is to use the revised RST as framework for studying traits associated with loneliness and to examine potential mediators between RST traits and loneliness.

Reinforcement Sensitivity Theory

The original RST proposed the existence of two motivational systems that regulate approach and avoidance behaviour (Gray, 1982). The Behavioural Activation System (BAS) is sensitive to rewards and regulates approach behaviour whereas the Behavioural Inhibition System (BIS) is sensitive to punishment and involves anxiety. Because social relationships contain powerful rewards and punishments, RST provides a useful framework for studying loneliness. Lonely people, for instance, are high in punishment sensitivity and low in reward sensitivity (Chang, Kahle, Yu, & Hirsch, 2014). High punishment sensitivity and low reward sensitivity have also been linked to poorer social functioning, as measured by both loneliness and low popularity ratings (Kingsbury, Coplan, Weeks, & Rose-Krasnor, 2013). Although these studies are consistent in their findings, both used Carver and White's (1994) BIS/BAS scale, a measure of the original RST. In this scale, BIS taps both fear and anxiety (Heym, Ferguson, & Lawrence, 2008). There is, however, substantial evidence that fear and anxiety are distinguishable, leading to the revised RST, which split the BIS into a fear system and an anxiety system (Gray & McNaughton, 2000). Thus, it is unknown whether the association between loneliness and original BIS is based on fear, anxiety, or both.

In the revised RST, fear and anxiety are clearly distinguished. The Fight, Flight, Freeze System (FFFS) underlies fear and the revised BIS (r-BIS) underlies anxiety (Gray & McNaughton, 2000). The FFFS reflects punishment sensitivity and is the primary detector of threat. R-BIS detects conflict between FFFS and r-BAS, when both reward and threat are present. The revised BAS (r-

BAS) remains relatively unchanged (although see Smillie, Pickering, & Jackson, 2006). The new components of RST can be measured with a new scale (Jackson, 2009) that measures r-BIS and FFFS, distinguishing between anxiety/conflict and fear/punishment sensitivity.

The purpose of the current paper is to test the relationship between the revised RST and loneliness. Because high levels of the original BAS are associated with lower loneliness (Chang et al., 2014) and because social situations hold many rewards including status and affiliation that those high in r-BAS would pursue more strongly (Corr, DeYoung, & McNaughton, 2013), we expect that high r-BAS should predict lower loneliness. High levels of the original BIS are associated with higher loneliness (Chang et al., 2014); however, because original BIS taps fear and anxiety, it is unclear whether loneliness is more related to fear (FFFS) or anxiety (r-BIS). Social situations frequently engage r-BIS because r-BIS manages conflict between approach and avoidance, which emerge frequently in social situations (Corr, 2005). For example, talking to people involves approach despite fearing rejection (Corr et al., 2013). Despite r-BIS being heavily engaged in social situations, being high in r-BIS would not necessarily relate to loneliness because the cautious approach typical of r-BIS would not necessarily damage social relationships. In contrast, FFFS is more strongly related to avoidance which, especially if applied to avoiding other people, could be damaging to social connection. Thus, we expect that high FFFS, rather than r-BIS, will predict higher loneliness.

Mediators of Reinforcement Sensitivity

We sought to identify mediators that would help us understand the association between r-RST traits and loneliness. We identified four potential mediators that relate to the rewards and threats in social situations: shyness, sociability, communal orientation, and acceptance. High punishment sensitivity may increase loneliness through higher shyness because someone who is punishment sensitive may seek to avoid the potential threats inherent in social interactions. Avoiding social interactions is characteristic of shy people, who experience negative affect around others and are withdrawn, a set of tendencies that predict higher loneliness longitudinally (Cheek & Busch, 1981). Shyness overlaps with social anxiety, which is predicted, in the original RST, by high levels of punishment sensitivity and low reward sensitivity (Coplan, Wilson, Frohlick, & Zelenski, 2006). Therefore, shyness should mediate the link between punishment sensitivity (FFFS) and loneliness and between reward sensitivity (r-BAS) and loneliness.

Reward sensitivity may reduce loneliness by increasing sociability. Sociability is defined as the motivation to interact with others and is distinguished from shyness which is discomfort with strangers or acquaintances (Cheek & Buss, 1981). Although sociability shows a moderate negative correlation with shyness, shyness and sociability are distinguishable (Cheek & Buss, 1981), meaning both could independently predict loneliness. R-BAS should relate to sociability because

high r-BAS individuals should be more motivated by the potential rewards of social interaction. We do not expect a correlation between punishment sensitivity (fear) and sociability because trait fearfulness, measured by items like, "When I get scared, I panic," correlates with shyness but not sociability (Bruch, Gorsky, Collins, & Berger, 1989). Thus, sociability should mediate the link between reward sensitivity (r-BAS) and loneliness but not between punishment sensitivity (FFFS) and loneliness.

High reward sensitivity may also reduce loneliness through higher communal orientation. Communal orientation reflects helpfulness and a disposition to be concerned with others' welfare (M. S. Clark, Oullette, Powell, & Milberg, 1987). Communal orientation may improve a person's social network and social interactions because others may be more attracted to helpful people. Communal orientation could be predicted by reward sensitivity because people find it rewarding to help others (R. F. Weiss, Boyer, Lombardo, & Stich, 1973) and those high in reward sensitivity may experience a greater reinforcing effect from helping others. Thus, communal orientation should mediate the link between reward sensitivity (r-BAS) and loneliness.

Lastly, reinforcement sensitivity may affect loneliness through acceptance. Acceptance is a disposition to accept thoughts and feelings rather than seeking to control or change them (Bond et al., 2011). The most effective way to control feelings in the short-term is to avoid situations linked to these feelings; thus, experiential avoidance is the opposite of acceptance (S. C. Hayes, Strosahl, & Wilson, 2003). High reward sensitivity should encourage approach behaviour, reducing levels of experiential avoidance, increasing levels of acceptance. In contrast, high fear (FFFS) should encourage avoidance, reducing acceptance. Previous research has found high FFFS predicts lower levels of acceptance (D. M. T. Clark & Loxton, 2012).

High acceptance may improve connection between people and reduce loneliness. Controlling thoughts can be cognitively draining (Klein & Boals, 2001), potentially leaving people impaired in social interactions. Lonely people pay less attention to people in interactions (Jones, Hobbs, & Hockenbury, 1982) and are perceived to be less involved in their conversations (Bell, 1985). Controlling thoughts and feelings may also bias people towards focusing on their inner thoughts and feelings. Self focus increases anxiety during social interactions (Woody, 1996). Thus, acceptance should mediate the link between reward (r-BAS) and loneliness and between punishment sensitivity (FFFS) and loneliness.

Current Study

Previous research found high levels of the original BAS predicted lower loneliness and high levels of the original BIS predicted higher loneliness. However, original BIS conflated fear and anxiety, so we used the revised RST to test whether FFFS (fear) or r-BIS (anxiety) would relate to loneliness. We expected that high FFFS would be associated with higher loneliness because those

high in trait fear are more likely to withdraw from potential relationships. We expected no relationship between r-BIS and loneliness because those with a tendency to cautiously approach may be more able to continue to seek out companionship even in the face of possible rejection. We expected that high r-BAS would be associated with lower loneliness because r-BAS would motivate pursuit of social rewards. We examined potential mediators between loneliness and FFFS and r-BIS, including communal orientation, shyness, sociability, and acceptance. We expected high sociability, communal orientation, and acceptance would be associated with lower loneliness whereas high shyness would be associated with higher loneliness. We expected that all four mediators would mediate the relationship between r-BAS and loneliness. We expect that only shyness and acceptance will mediate the relationship between FFFS and loneliness. Fear has been previously linked to shyness and acceptance, whereas fear has shown no relationship to sociability and there is no reason to expect a relationship between communal orientation and fear.

Method

Participants and Procedure

We recruited 406 people from Amazon's Mechanical Turk. We restricted participation to US residents who had a high approval rate for previous Mechanical Turk tasks. We excluded 36 people for failing the attention check questions, "Please click 'completely agree' for this question," or "I am currently using a computer (Meade & Craig, 2012)." This left 370 participants with 142 (38.4%) men and 228 (61.6%) women. The sample comprised of 272 (73.5%) Caucasians, 26 (7.0%) African Americans, 25 (6.8%) Asians, and 46 (12.4%) of other races. The average age was 36.30 (*SD* = 13.78). Participants completed the questionnaire online. For all measures, higher scores indicate higher levels of the construct being measured.

Measures

Jackson 5

We measured revised RST traits with the 30-item Jackson-5 (Jackson, 2009). Participants rated their agreement on a 5-point scale from 1 (*completely disagree*) to 5 (*completely agree*). R-BAS was measured with 6 items such as, "I like to do things which are new and different." FFFS was measured with 18 items such as, "I can't help but feel terrified if I see a dangerous animal." R-BIS was measured with 6 items such as, "I want to avoid looking bad."

Shyness and Sociability

Shyness and sociability were measured on a 14-item scale (Cheek & Buss, 1981). Participants rated their agreement on a 5-point scale from 1 (*completely disagree*) to 5 (*completely agree*). Shyness was measured with 9 items such as, "I feel tense when I'm with people I don't know well." Sociability was measured with 5 items such as, "I like to be with people."

Acceptance

We measured acceptance with a 10-item scale (Bond et al., 2011). An example item is, "I worry about not being able to control my worries and feelings." Participants indicated the extent to which each statement was true on a scale from 1 (*never true*) to 7 (*always true*).

Communal Orientation

Communal orientation was measured with a 14-item scale (M. S. Clark et al., 1987). Participants rated how characteristic different statements were of them on a 5-point scale, from 1 (*extremely uncharacteristic*) to 5 (*extremely characteristic*). An example item is, "When making a decision, I take other people's needs and feelings into account."

R-UCLA Loneliness Scale

Loneliness was measured with the 20-item revised UCLA loneliness scale (Russell et al., 1980). Participants rated how often they have various experiences on a 4-point scale from 1(*never*) to 4 (*often*). An example item is, "I feel left out."

Results

The means, standard deviations, and correlations of the study variables are presented in Table 4. FFFS correlated positively with r-BIS and negatively with r-BAS. R-BAS and r-BIS correlated positively. There was a strong negative correlation of loneliness with acceptance and sociability and a strong positive correlation with shyness; over a quarter of the variance in loneliness was accounted for by shyness, sociability and acceptance individually. High r-BAS predicted lower loneliness whereas high FFFS predicted higher loneliness. R-BIS was not associated with loneliness. High r-BAS predicted higher sociability, lower shyness, higher acceptance and higher communal orientation whereas high FFFS predicted higher shyness and lower acceptance. High r-BIS was associated with lower acceptance and higher communal orientation; however, controlling for FFFS, r-BIS did not predict acceptance ($\beta = -.07$, $t = -1.33$, $p = .19$), but r-BIS continued to predict communal orientation ($\beta = .16$, $t = 2.96$, $p < .01$).

Table 4

Means, Standard Deviations, and Correlations of Study Variables. Values in Parentheses Represent Internal Consistency.

		M	*SD*	1	2	3	4	5	6	7	8
1.	Loneliness	43.45	12.64	(.94)							
2.	R-BAS	21.57	4.15	-.31**	(.82)						
3.	R-BIS	21.90	4.02	-.02	.28**	(.78)					
4.	FFFS	17.46	2.67	.18**	-.13**	.29**	(.71)				
5.	Acceptance	47.86	11.94	-.57**	.20**	-.17**	-.38**	(.91)			
6.	Shyness	36.63	8.39	.53**	-.30**	.01	.47**	-.50**	(.91)		
7.	Sociability	15.45	4.38	-.49**	.41**	.20**	-.01	.23**	-.46**	(.84)	
8.	Communal Orientation	49.92	6.70	-.31**	.18**	.15**	.02	.06	-.10	.24**	(.73)

We tested the hypothesised model in which r-BAS and FFFS were independent variables, loneliness was the dependent variable, and shyness, sociability, communal orientation, and acceptance were the mediators, using Bias Corrected Percentile Bootstrapping (A. F. Hayes & Preacher, 2014). We used the SPSS macro MEDIATE. MEDIATE allows us to test the full mediation model, with multiple independent and mediating variables, testing each mediation path, controlling for each other mediation path. The results of each independent variable and mediator are controlled and independent from the other independent variables and mediators.

The overall mediation model shown in Figure 5 was supported. Table 5 shows the combined effect of both r-BAS and FFFS on the mediators. For all mediators, there was a significant model, showing that r-BAS and FFFS combined predicted all mediators. Most mediators had a moderate amount of variance predicted by r-BAS and FFFS, except for communal orientation which had little of its variance predicted by r-BAS and FFFS. Figure 5 shows the beta weights of all the statistically significant relationships between the independent variables, mediators, and dependent variable. R-BAS was a significant predictor of all mediators. FFFS was a significant predictor of shyness and acceptance, but did not predict sociability ($\beta = -.04$, $t = -.91$, $p = .36$) or communal orientation ($\beta = -.05$, $t = -.92$, $p = .36$). FFFS continued to be a significant direct predictor of loneliness after controlling for the other predictors ($\beta = -.11$, $t = -2.56$, $p = .01$), yet R-BAS was not a significant predictor of loneliness ($\beta = -.04$, $t = -.99$, $p = .32$) after controlling for the other predictors.

Table 5

Total Effect of R-BAS and FFFS on the Four Mediators

Dependent Variable	*R*	R^2_{Adj}	*F*	*df*	*p*
Shyness	.52	.27	68.93	2.00, 367.00	.0000
Sociability	.41	.16	37.27	2.00, 367.00	.0000
Acceptance	.40	.16	36.65	2.00, 367.00	.0000
Communal Orientation	.18	.03	6.22	2.00, 367.00	.0022

The total model with 6 predictors of loneliness was significant, $R = .73$, $R^2_{adj} = .52$, $F(6, 363) = 68.33$, $p < .01$. Figure 5 shows the beta weights for the 4 mediators predicting loneliness. Table 6 shows the unstandardised overall mediation effect for r-BAS and FFFS for the four mediators. The 95% confidence intervals are shown for the overall mediation. If the confidence interval excludes zero, a mediated effect is occurring for that independent variable and mediator, controlling for the other independent variables and mediators. R-BAS showed a significant mediation for all four mediators. High r-BAS was associated with lower shyness, higher sociability, higher acceptance, higher communal orientation, and consequently lower loneliness. FFFS showed a significant mediation for two mediators. High FFFS was associated with higher shyness and lower acceptance and consequently higher loneliness. FFFS did not show a mediated effect through communal orientation or sociability on loneliness.

Table 6

Total Indirect Effects for the Four Mediators.

		B	s.e.	LLCI	ULCI
Indirect through Shyness					
	r-BAS	-.1752	.0678	-.3188	-.0901
	FFFS	.4916	.1195	.2688	.7366
Indirect through Sociability					
	r-BAS	-.2814	.0678	-.4144	-.1648
	FFFS	.0475	.0641	-.0505	.2225
Indirect through Acceptance					
	r-BAS	-.1876	.0737	-.3346	-.0436
	FFFS	.6984	.1307	.4603	.9735
Indirect through Communal Orientation					
	r-BAS	-.1115	.0429	-.2228	-.0448
	FFFS	-.0456	.0556	-.1650	.0601

Note. A confidence interval not containing zero indicates a significant mediation for the mediator and independent variable, controlling for all other mediators and independent variables.

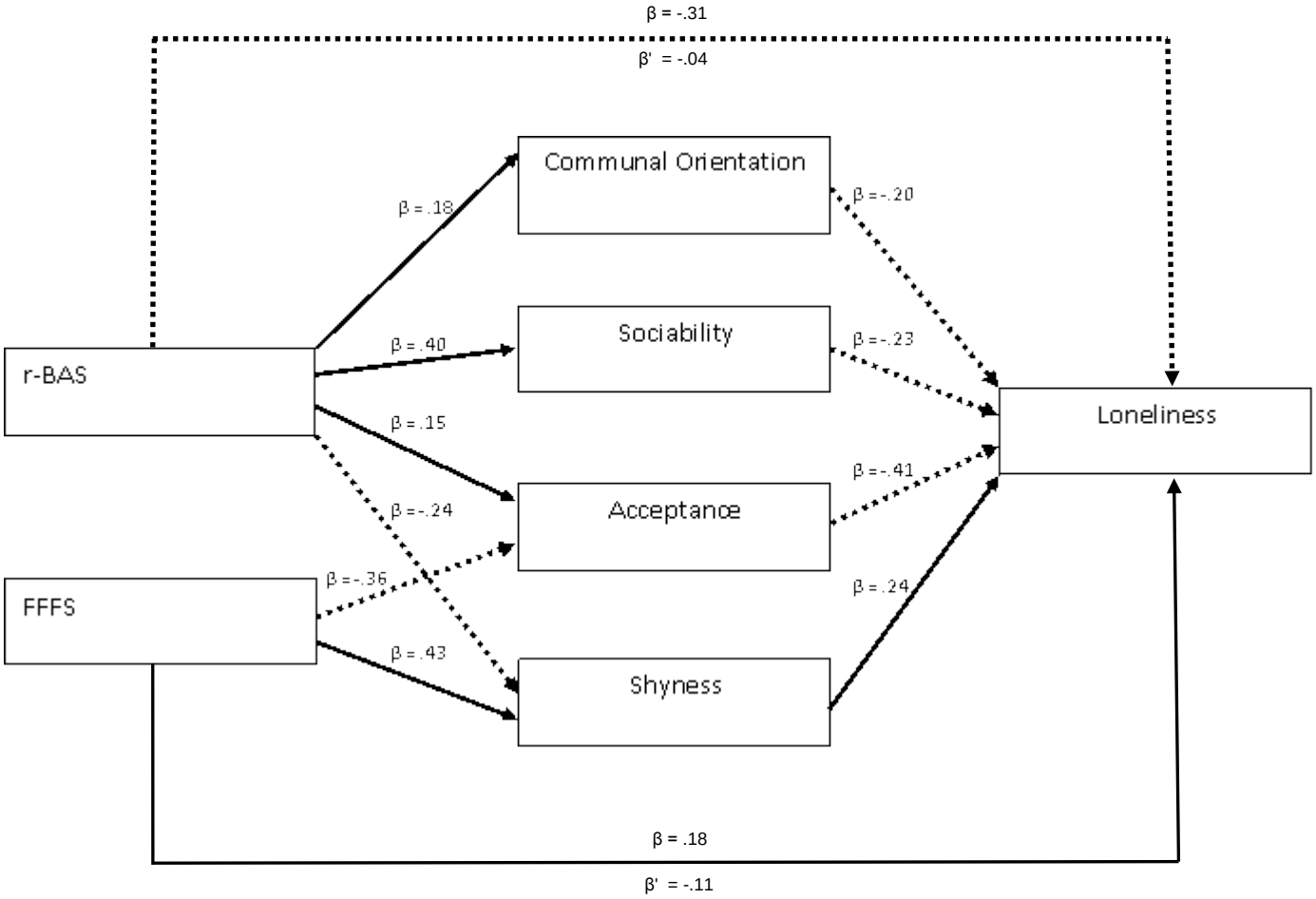

Figure 5. Multiple mediation model with six predictors of loneliness. Bold lines represent positive associations while dashed lines represent negative relations. All beta weights are significant, $p < .01$, except for r-BAS predicting loneliness, when controlling for the other predictors. High FFFS predicts higher loneliness, mediated by lower acceptance and higher shyness. High r-BAS predict lower loneliness, mediated by higher communal orientation, higher acceptance, higher sociability and lower shyness.

Discussion

We tested a multiple mediation model that predicts loneliness. People higher in r-BAS were less lonely. This association was mediated by having higher sociability, higher communal orientation, higher acceptance, and lower shyness. People higher in FFFS were lonelier and this effect was mediated by higher shyness and lower acceptance. R-BIS did not show an overall relationship with loneliness. The overall model predicted over half the variance in loneliness. When considered in isolation, acceptance predicted over a quarter of the variance in loneliness. After controlling for the other predictors, acceptance accounted for over 15% unique variance, whereas shyness accounted for 5% unique variance. Shyness and acceptance showed a strong negative

relationship suggesting substantial shared variance between shyness and acceptance. Altogether, this model shows the strength of personality as a predictor of loneliness.

Reinforcement Sensitivity Theory

Previous research linked higher loneliness with high levels of original BIS and low levels of original BAS (Chang et al., 2014). The current study was consistent with the BAS finding but found that loneliness was associated with FFFS (fear) but not r-BIS (anxiety). The current study provides further support for the revised RST, finding support for the distinction between fear and anxiety, finding fear and anxiety predicted different outcomes. Anxiety, not fear, was linked to higher communal orientation. Fear, not anxiety, was linked to higher loneliness and higher shyness. Although anxiety was related to acceptance there was no relationship between anxiety and acceptance after controlling for fear.

The lack of relationship between r-BIS (anxiety) and loneliness contrasts with theorising that links BIS to social situations. R-BIS is active in social situations because social situations are complex and frequently have both approach and avoidance elements (Corr, 2005). Anxious people should be attuned to social comparison and personal failure, motivating attention and cognitive processes aimed at preventing ostracism (White & Depue, 1999). These extra cognitive processes do not appear to be lowering loneliness as our study did not find a link between anxiety and loneliness. In contrast, we found FFFS (fear) was associated with shyness and loneliness. The link between loneliness and fear but not anxiety can be understood by considering how fear and anxiety may affect social behaviour, including meeting new people, applying for a job, or going to a social event. Whereas a fearful person may avoid meeting new people, delay job applications, and avoid social events, increasing their isolation, an anxious person would be more likely to approach social situations cautiously, meeting new people, applying promptly for jobs, and going to social events. Anxious people's tendency to approach cautiously may compensate for any disadvantages of high anxiety.

Interventions to Reduce Loneliness

The current study explored mediators between RST and loneliness. Understanding the mechanisms underlying the relationship between RST and loneliness can be helpful in designing interventions to reduce loneliness, especially considering that RST traits are considered biologically-based and less malleable to change. However, the mediators—shyness, acceptance, sociability and communal orientation—may provide avenues of change for those who struggle with loneliness. Interventions based on teaching individuals to manage risky personality traits like impulsivity and anxiety have been successfully used to reduce drug and alcohol use in adolescents (Conrod, Stewart, Comeau, & Maclean, 2006). Similar personality-targeted interventions may also help address loneliness and other distressing disorders such as social phobia. The strongest predictor

of loneliness in our study, acceptance, has been previously shown to be responsive to intervention both in traditional therapy (S. C. Hayes et al., 2003), and self-help workbooks (Muto, Hayes, & Jeffcoat, 2011). Future research could explore the effect of acceptance on social interactions and use existing interventions to increase acceptance to see if such interventions could improve social interactions and reduce shyness. Acceptance may lead to more engagement in social interactions because controlling thoughts impairs cognition (Klein & Boals, 2001), which could impair social interactions. Future research could also examine the effect of acceptance interventions on conversational involvement (e.g. Bell, 1985).

Limitations and Future Research

The main limitation of this study was that it was cross-sectional, leaving causality uncertain. However, some of the paths specified by the overall model are not plausible in the reverse direction. Both r-BAS and FFFS are innate neurologically driven traits; it would be unlikely for them to be caused by the other factors in this study or a third variable not measured. Thus, the link between RST and loneliness and the link between RST and communal orientation, shyness, sociability, and acceptance should be in the specified causal direction. There is longitudinal evidence that shyness predicts increases in loneliness (Cheek & Busch, 1981). The direction of causality remains uncertain for the link between loneliness and sociability, communal orientation, and acceptance. Further studies can use longitudinal designs to investigate these links. Another potential limitation of the study is that the online sample of Mechanical Turk may not be representative of the population. Many studies, however, have found that Mechanical Turk findings replicate those found with other samples (Rand, 2012). All samples can test and possibly falsify an underlying theory, potentially advancing the literature (Mook, 1983). For instance, if an online sample did not find a meaningful distinction between fear and anxiety, this would weaken confidence in the revised RST, regardless of whether this distinction only emerged in a specific population. Another limitation is that the study failed to use a more recent version of the R-UCLA loneliness scale that was designed to reduce item ambiguity (Russell, 1996). Participant confusion over items may have led to the reported effects being underestimated.

Conclusion

Trait differences in reward and punishment sensitivity predicted motivations and orientations toward social relationships and these orientations predicted loneliness. Greater reward sensitivity predicted lower loneliness through higher sociability, higher communal orientation, higher psychological acceptance, and lower shyness. Greater punishment sensitivity predicted higher loneliness through higher shyness and lower psychological acceptance. There was no relationship between r-BIS and loneliness despite r-BIS theoretically being highly active in social situations. Broadly, this suggests approach tendencies are beneficial for loneliness, avoidance

tendencies are harmful for loneliness, but sensitivity to conflict between approach and avoidance appears to be neither harmful nor helpful for loneliness.

Chapter 4

The main limitation of Chapter 3 was the cross-sectional design. Sociability could lower loneliness, loneliness could lower sociability, or a third factor could impact both. Further, sociability may encompass additional factors not measured previously. Chapter 4 addresses these issues by using a longitudinal design and measuring different potential elements of sociability. Chapter 4 focuses on sociability, rather than acceptance or communal orientation, because efforts to reduce loneliness often focus on sociability (Loe, 2012; Rosenberg, 2014).

Cross-lagged relations between sociability and loneliness

Loneliness, the subjective sense of isolation, correlates with poor physical health, depression, and suicide (Holt-Lunstad, Smith, & Layton, 2010; Stravynski & Boyer, 2001; Wei et al., 2005; Wilbert & Rupert, 1986). In older adults, loneliness longitudinally predicts mortality (Penninx et al., 1997), and in children, loneliness longitudinally predicts depression (Qualter, Brown, Munn, & Rotenberg, 2010). Loneliness correlates with lower sociability; lonely people show less preference to be with others (Cheek & Buss, 1981; D. M. T. Clark et al., 2015b), and it is widely assumed that increasing sociability will reduce loneliness, although two aspects of the relationship between sociability and loneliness remain undetermined. First, the correlation could result from sociability reducing loneliness, loneliness reducing sociability or a third factor affecting sociability and loneliness. Second, there may be other types of sociability that can be distinguished. The aim of the current study is to examine if different types of sociability can be distinguished and how different types of sociability relate to loneliness over time using a longitudinal design.

Sociability to Lower Loneliness

People believe loneliness is caused by low sociability. This belief underlies common advice to reduce loneliness. For example, Cacioppo and Patrick (2008) recommend lonely people extend themselves by initiating small social encounters, develop an action plan of social contact (volunteering at a charitable organisation), select the relationships that are the most promising, and expect the best by being optimistic and seeing the potential in relationships. These suggestions echo the suggestions to lonely people found on the internet from sources such as *The Huffington Post* and *Psychology Today*, which advise lonely people to join groups, create social groups, reach out to neighbours, and be open (Loe, 2012; Rosenberg, 2014). Despite the frequency of the advice to be more social, the relationship between loneliness and sociability has not been extensively examined in the research literature, and only cross-sectional research supports the argument that sociability reduces loneliness.

Loneliness to Lower Sociability

The idea that sociability reduces loneliness is intuitively appealing; however, the correlation between loneliness and lower sociability could be caused by loneliness reducing sociability. Loneliness reducing sociability is argued by the social desensitization model. The social desensitization model states that if a person has repeatedly experienced rejection, they are likely to expect rejection in the future, and their expectations of rejection will reduce their motivation to pursue relationships, lowering their sociability (Moller et al., 2010). This is a process of desensitization in which people who have not experienced belonging become desensitized to future belonging. The desensitization model is supported by various diary studies of people's daily experiences. People who were lonely had lower positive affect in response to belonging throughout

their day (Reis, Sheldon, Gable, Roscoe, & Ryan, 2000). This result was replicated in a laboratory study. People who had higher levels of existing belonging had more positive emotion in response to reading a vignette of a meaningful interaction and imagining they were experiencing that interaction (Moller et al., 2010). As well as being less sensitive to positive belonging experiences, lonely people may be more sensitive to negative belonging experiences. For example, people who felt less valued by their intimate partners felt more hurt when their partners were unusually moody or badly behaved (S. L. Murray, Bellavia, Rose, & Griffin, 2003). These studies were cross-sectional, failing to conclusively establish whether loneliness is a causal factor.

The social desensitization model is also supported by some longitudinal and experimental evidence. Children who had been institutionalized had an impaired oxytocins response, which impairs their tendency to form social bonds (Fries, Ziegler, Kurian, Jacoris, & Pollak, 2005). Furthermore, infants securely attached at one age, were later rated as having more social skills, which further predicted positive social experiences, both romantic and platonic, as teenagers and adults (Simpson, Collins, Tran, & Haydon, 2007). The social desensitization model was also supported by studies that experimentally manipulated rejection that found rejection makes people less helpful (Twenge et al., 2007), and more aggressive (Twenge et al., 2001).

Loneliness to Greater Sociability

In contrast with the social desensitization model, the social pain model of loneliness suggests that loneliness *increases* sociability. Researchers argue that loneliness acts like physical pain, motivating people to form connections when they are isolated or rejected, and this motivation to reconnect is the reason why loneliness evolved (Cacioppo & Patrick, 2008; Eisenberger et al., 2003). The pain model is supported by several lines of evidence. Lonely people remember more social information than less lonely people (Gardner, Pickett, Jefferis, & Knowles, 2005). People who report fewer friends are more accurate in identifying the emotions expressed on faces and are more attentive to vocal tone (Gardner et al., 2005). Rejection improves memory for social events (Gardner et al., 2000). Furthermore, rejection improved performance on a task when it was described as indicative of getting on well with others, but not if it was described as diagnostic of good health (DeWall et al., 2008). Rejection increased the probability that people would express an interest in working with others, perceive others as friendly, and allocate more cash rewards to a partner (Maner et al., 2007).

Overall, the extant literature suggests that 1) sociability may reduce loneliness, 2) loneliness may reduce sociability, and 3) loneliness may increase sociability. The social desensitization model argues that people low in belonging become desensitized to experiencing belonging, whereas the social pain model argues people low in belonging should be more motivated to establish connections. The apparent contradiction between loneliness both increasing and

decreasing sociability may be resolved by considering different types of sociability; loneliness may reduce some types of sociability, whereas loneliness may increase other types of sociability. Furthermore, some types of sociability may reduce loneliness, whereas other types may not reduce loneliness. Loneliness has been divided into different elements: collective disconnection, relational disconnection, and isolation (Hawkley, Browne, & Cacioppo, 2005). Isolation is the subjective sense of isolation, relational disconnection is poor interpersonal ties, and collective disconnection is poor group ties.

Distinguishing Facets of Sociability

The research literature has primarily distinguished between shyness and sociability. Sociability has been defined as the preference to be with others (Cheek & Buss, 1981), whereas shyness has been defined as inhibition in social situations and the experience of negative affect around others (Cheek & Busch, 1981). Although there is a strong negative correlation between shyness and sociability (D. M. T. Clark et al., 2015b), there is a clear distinction between shyness and sociability. Shyness and sociability split into two factors (Cheek & Buss, 1981) and are distinguishable neurally (Schmidt, 1999). The distinction between shyness and sociability is echoed in other research, but with shyness named social anxiety and low sociability named social anhedonia (Brown, Silvia, Myin-Germeys, & Kwapil, 2007). Both shyness and sociability continue to predict loneliness after controlling for each other (D. M. T. Clark et al., 2015b), although only shyness has been tested longitudinally and shown to predict loneliness (Cheek & Busch, 1981).

The definition of both shyness and sociability include the tendency to be around others and emotional reactions to others. In contrast, the items used to measure shyness and sociability appear to primarily relate to affect. The sociability items include, “I find people more stimulating than anything else,” “I’d be unhappy if I were prevented from making many social contacts,” while the shyness items include, “I feel tense when I’m with people I don’t know well,” “I feel nervous when speaking to someone in authority,” and “I feel inhibited in social situations” (Cheek & Buss, 1981). We argue these measures operationalise shyness as fear of others and sociability as enjoyment around others. The definitions of shyness and sociability assume the behaviour matches emotion, yet people frequently override their emotions and urges so that behaviour and emotions may not match (Baumeister, Heatherton, & Tice, 1994). We argue that people may differ in their tendency to approach others and how much effort they put into socializing, regardless of the amount of enjoyment or fear they experience around others. For example, a person may dislike being around others, yet feel obligated to be social. In contrast, someone who enjoys being around others may not believe that social contact is worth much effort, especially compared to other life goals, such as career promotion.

Another potentially overlooked distinction is between social enjoyment and desire for social contact. The overlap between social enjoyment and social desire is supported by evidence that people who experience less social enjoyment express greater preference to be alone (Brown et al., 2007). In contrast, social enjoyment may be distinct from desire for social connection. A person who desires social connection with others may nevertheless find social interaction unpleasant. A distinction between enjoyment and desire is supported by research. Outside of relationship research, enjoyment and desire are supported by separate neural pathways (K. S. Smith, Berridge, & Aldridge, 2011). The distinction between enjoyment and desire is seen in research on addiction. The process of addiction increases desire, but does not affect enjoyment; an addict may desire a drug highly, yet not enjoy consuming it (Berridge & Robinson, 1995). The distinction between enjoyment and desire is shown in reaction to being thwarted from obtaining something. When people are thwarted from obtaining a desired item, desire is increased, while enjoyment of the item is decreased (Litt, Khan, & Shiv, 2009). The distinction between enjoyment and desire may resolve the contradiction between the social sensitisation model and the social pain model. Given thwarted desires increase desire and decrease enjoyment, and lonely people are denied relationships, it is plausible that loneliness makes people enjoy being around others less but desire social connection more.

Strong Ties and Weak Ties

The literature on sociability focuses on general sociability, ignoring the strength of relationship ties. The strength of a relationship tie can be characterised as a combination of the amount of time, intimacy, emotional intensity, and reciprocity experienced in a relationship (Granovetter, 1973). Strong ties include close friends, who display frequent interaction, high closeness, and intimacy, whereas weak ties include casual acquaintances, who display infrequent interaction, low closeness, and low intimacy. The literature has long assumed weak ties produce alienation (Wirth, 1938), and many studies support the power of strong ties. Married people were more than twice as likely to survive coronary surgery than people who were not married (King & Reis, 2012). Women who held their husband's hand had less of a neural response to the threat of an electric shock than women who held the hands of a stranger, who had less neural response than women not holding anyone's hand (Coan, Schaefer, & Davidson, 2006). Furthermore, people were more happy reflecting on a time they spent money on a strong tie than a weak tie (Aknin, Sandstrom, Dunn, & Norton, 2011).

Weak ties, however, may also have a large impact on belonging, and the value of weak ties may be underestimated. Weak ties connect people to their wider communities, whereas strong ties can only encompass a small number of people, which leads to fragmentation (Granovetter, 1973). People feel greater belonging on days when they interact with more weak ties than days they

interact with fewer weak ties (Sandstrom & Dunn, 2014). People feel more belonging when they make eye contact, smile, and have a small conversation with their barista than when they make the interaction with their barista as efficient as possible (Sandstrom & Dunn, 2013). People underestimate the positive emotions produced by interacting with a stranger, whereas they overestimate the positive emotions produced by interacting with their romantic partner (Dunn, Biesanz, Human, & Finn, 2007). People expect to enjoy a solitary train ride more than a ride where they interacted with strangers, but people enjoyed the train ride more when they were instructed to interact with strangers (Epley & Schroeder, 2014). Even momentary interactions with strangers can affect belonging. People feel more belonging when passersby made eye contact than when passersby look past them (Wesselmann, Cardoso, Slater, & Williams, 2012).

Current Study

Two primary types of sociability have been described in the literature: shyness and social enjoyment, which are the tendencies to experience fear and enjoyment around others. Although the definitions of shyness and sociability included behavioural components, the constructs are operationalized primarily by scales assessing feelings. We present scale items to specifically represent how much people approach others and how much effort they put into their relationships. These individual differences are potentially distinct from shyness and sociability because a shy person may either override their fears and approach people, or choose not to override their fears. Another form of sociability could be desire, which could be distinct from social enjoyment. In addition, sociability for weak ties and strong ties may vary. A person may be willing to put effort into their close relationships, yet may ignore cab drivers and strangers on the street. A preference for strong ties may be especially true of lonely people seeking to increase their belonging because of the underestimation of the effect of weak ties.

The purpose of our study was to examine whether different forms of sociability could be distinguished, and to examine whether sociability leads to lower loneliness, loneliness leads to higher sociability, or loneliness leads to lower sociability. We created new sociability items that tapped effort, desire, tendency, and enjoyment for both strong and weak ties and measured these alongside the existing shyness and sociability (social enjoyment) scale. We measured these factors and loneliness at two times points 7 weeks apart. We hypothesised that new sociability factors would emerge, distinct from the existing shyness and sociability (social enjoyment) factors. We used a longitudinal design to examine whether some types of sociability may reduce loneliness, and whether loneliness may increase some types of sociability, while reducing other types of sociability.

Method

Participants and Procedure

We recruited participants through Amazon's Mechanical Turk (Rand, 2012). Participants were restricted to the United States and people who had previously done over 5000 tasks on Mechanical Turk with over 98% approval rating for previous tasks. There were 613 participants, comprised of 280 (45.7%) men and 333 (54.3%) women. The average age was 36.30 (*SD* = 11.93). The sample contained 481 (78.5%) Caucasians, 37 (6.0%) Asians, 54 (8.8%) African-Americans, and 41 (6.7%) people of other races. Participants completed the survey online. Seven weeks after completing the first survey, we assigned participants a qualification that gave them access to the second survey, and we emailed participants to do the second survey. The second survey contained the same items as the first survey. Of participants who did the first survey, 386 (62.97%) completed the second survey. We linked participants' time 1 and 2 responses using the participants' Mechanical Turk ID number. We excluded 23 people who answered "agree" or "strongly agree" to the statement, "All my friends think I would make a good leprechaun," (Meade & Craig, 2012), in either the time 1 or time 2 survey, leaving 363 participants.

Measures

R-UCLA Loneliness Scale

Loneliness was measured with the 20-item Revised UCLA loneliness scale (Russell et al., 1980). Participants rated how often they have various experiences on a 4-point scale from 1 (*never*) to 4 (*often*). An example item was, "I feel left out."

Shyness and Sociability

Shyness and sociability were measured on a 14-item scale (Cheek & Buss, 1981). Participants rated their agreement on a 5-point scale from 1 (*completely disagree*) to 5 (*completely agree*). Shyness was measured with 9 items including, "I feel tense when I'm with people I don't know well." Sociability was measured with 5 items including, "I like to be with people."

Desire, Effort, Tendency, and Enjoyment

We created a new set of items designed to capture aspects of sociability discussed earlier. The new items are listed in Table 7. Social desire was measured with 8 items such as "I wish I was more popular," on a scale from 1 (*not true of me*) to 5 (*very true of me*). Participants were asked to rate their sociability on 8 items representing weak tie sociability, including "When you buy groceries, talking to your cashier," and 8 item representing strong tie sociability, including, "Going out to eat with close friends." Each of these 16 items was rated on tendency, effort, and enjoyment. Tendency was assessed by asking participants how likely they would be to engage in the sample behaviour on a scale from 1 (*unlikely*) to 4 (*very likely*). Effort was assessed by asking participants how much effort each activity was worth on a scale from 1 (*no effort*) to 4 (*a great deal of effort*).

Enjoyment was assessed by asking participants how much they would enjoy each activity on a scale from 1 (*do not enjoy*) to 4 (*enjoy a lot*).

Analytical strategy

The first aim of our analysis was to examine if new forms of sociability can be distinguished from the existing shyness and sociability (social enjoyment) measures. To do this we used exploratory factor analysis on Time 1 scores of the existing shyness and sociability (social enjoyment) items alongside our new sociability items designed to tap social desire and effort, tendency, and enjoyment for both weak and strong ties. We then used confirmatory factor analysis on Time 2 scores to establish the factor structure of both sociability and loneliness. Hu and Bentler (1998) found that the standardized root square mean residual (SRMR) best identified mis-specified factor covariance, and the root-mean-square error of approximation (RMSEA), the comparative fit index (CFI), and the Tucker–Lewis index (TLI) best assessed mis-specified factor loadings. They recommend reporting the SRMR alongside one of the measures of loading misfit. We focus on interpreting the SRMR and RMSEA, but we also report CFI and TLI because they are reported frequently (Lang, Bliese, Lang, & Adler, 2011). Browne and Cudeck (1993) recommend that RMSEA values below .08 were reasonable, whereas values greater than 0.1 indicated poor fit. Hu and Bentler recommend a relatively good fit is obtained from the approximate cut-offs of .08 for SRMR, .06 for RMSEA, and .95 for TLI and CFI. In contrast, many researchers have pointed out problems with using strict cut-offs and have argued that cut-offs should be used with caution (Fan & Sivo, 2007; Marsh, Hau, & Wen, 2004; Sharma, Mukherjee, Kumar, & Dillon, 2005). Researchers should apply a multifaceted approach, assessing the meaningfulness of the model, rather than an exclusive focus on stringent cut-offs (Markland, 2007).

We analysed our cross-lagged study using structural equation modelling (SEM) techniques (Finkel, 1995; Little, Preacher, Selig, & Card, 2007). We used a two-step process. First, we examined whether metric invariance existed for each factor of sociability and loneliness. Metric invariance establishes that the meaning of the constructs has not changed over time (Little et al., 2007). Metric invariance occurs when the items load onto factors with very similar loadings across Time 1 and 2. To measure metric invariance, we constrained factor loadings so that the loadings of time 1 items on time 1 factors are equal to the loadings of time 2 items on time 2 factors. If constraining the factor loading lead to only small reductions in model fit, metric invariance is established. We used cut-offs from Chen (2007) for samples over 300: inadequate metric invariance is indicated by Δ CFI $\leq$.-010 and by Δ RMSEA $\geq$ .015. Second, we examined structural models to examine the cross-lagged relationship between sociability and loneliness. The cross-lagged structural model is shown in Figure 6, allowing us to examine the cross-lagged relationship between

sociability and loneliness, allowing us to examine whether loneliness leads or sociability or sociability leads to loneliness.

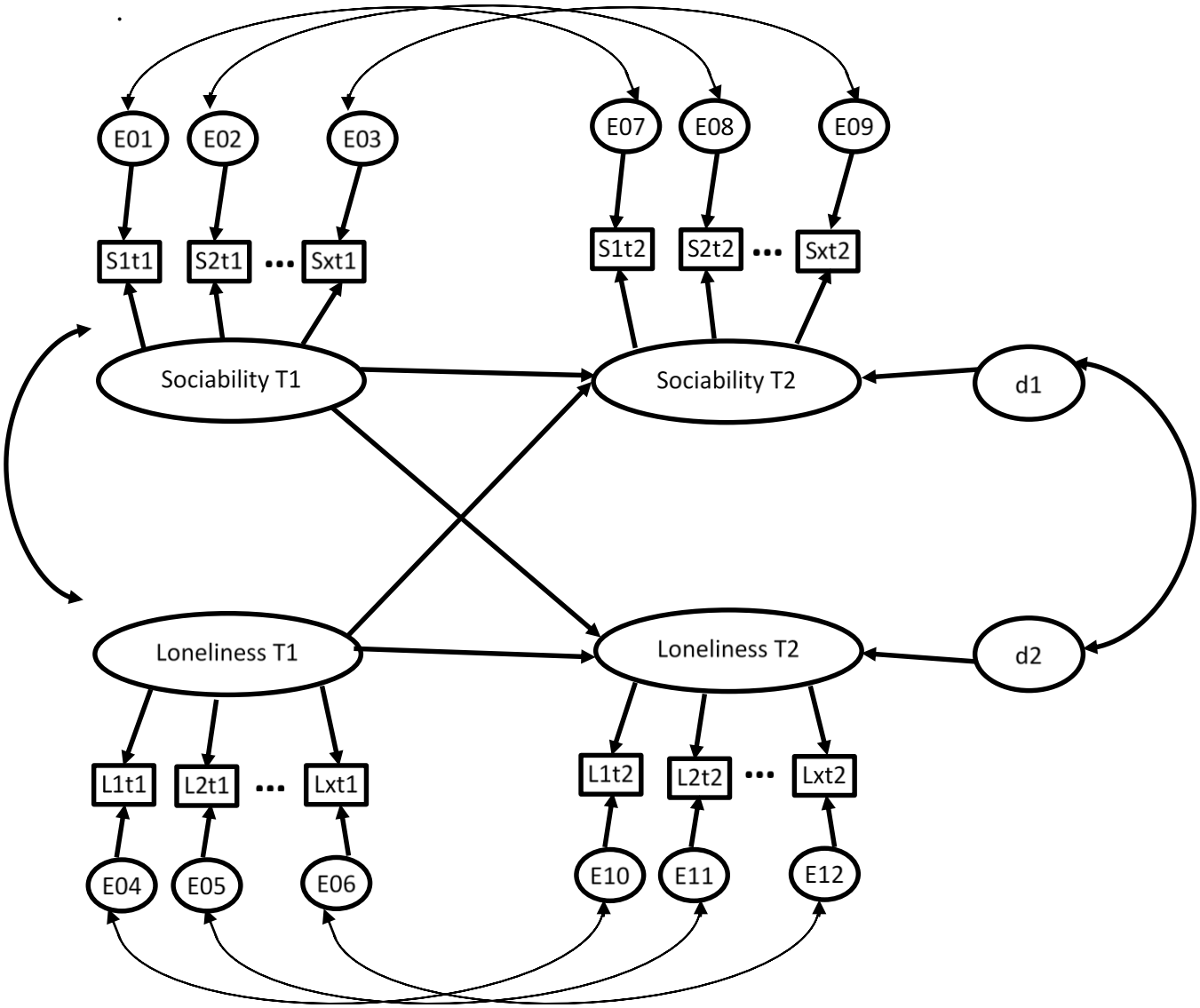

Figure 6. The cross-lagged structural equation model of loneliness and sociability. The cross-lagged panel model includes four different types of indicators. One, the correlations between the latent variables at Time 1. Two, the stability of each construct over time. Three, the two cross-lagged effects. Four, the correlation between the disturbances at Time 2. T1 = Time 1; T2 = Time 2; S1t1, S2t1, Sxt1 = items for sociability at Time 1; S1t2, S2t2, Sxt2 = items for sociability at Time 2; L1t1, L2t1, Lxt1 = items for loneliness at Time 1; L1t2, L2t2, Lxt2 = items for loneliness items at Time 2; e01-e99 = error variances for the items; d1 = error disturbance for sociability at Time2; d2 = error disturbance for loneliness at Time 2. The error terms are correlated for each item across Time 1 and 2.

Results

Exploratory Factor Analysis

We performed an exploratory factor analysis on both the existing shyness and sociability (social enjoyment) items and our new items of sociability. New sociability items presented social scenarios encompassing strong and weak ties. Each of these scenarios was rated on scales rating the tendency to be social, effort to be social, and enjoyment with sociability. Each scenario was presented 3 times with the 3 different rating scales. New sociability items also included items tapping desire for belonging rated on a "true of me" scale. We used common factor analysis rather than principle components because we were interested in the underlying structure of sociability (Floyd & Widaman, 1995). We used direct oblimin, oblique rotation. We performed the analysis on items from time 1. An initial examination of the factor loadings revealed that the new social enjoyment items combined with the existing sociability items and did not separate into their own factor and that a distinction between enjoyment of weak and strong ties did not emerge. For these reasons and to simplify the analysis, we dropped the new enjoyment items, running the exploratory factor analysis with only the existing social enjoyment items. We report the results without the new social enjoyment results, but both analyses provided very similar results.

There were 11 factors with eigenvalues above 1. The scree plot indicated that 5 factors should be retained. We decided to retain 7 factors: the 5 new factors and the existing factors of shyness and sociability (social enjoyment) because, of the new factors, the 6th largest factor only loaded onto two items and did not appear to be an important factor. Table 1 shows the factor loadings for the analysis. We named the first new factor "Social Desire" because it comprised items that measured a desire for more closeness, friends, or popularity. We named the second new factor "Weak Ties" because it comprised items that measured effort and tendency with weak ties. We named the third new factor "Strong Tie Effort" because it comprised items that measured effort with close ties. We named the fourth new factor "Networking Effort" because it comprised items that measured effort to join social groups and networking. We named the new fifth factor "Strong Ties Tendency" because it comprised items that measured tendency to engage with close ties.

There were several items that did not load (<.40) on any of the 7 factors. Most scale items were repeated using different rating scales so we identify the items by both their scale and the wording of the items. For the "very true of me" scale, two items did not load, "I wish other people were more polite," and "I wish other people were friendlier." For the "very likely" scale, eight items did not load, "Going to a party where you did not know anyone," "Going to a networking event," "Joining a new social group," "Going out to eat with a group of acquaintances," "Phoning a close friend you have not spoken to in a while," "Hosting a dinner with friends," "Keeping in touch with old friends," and "Going to a party with friends." For the "a great deal of effort" scale, two items

did not load onto one of the factors, “Phoning a close friend you have not spoken to in a while,” and “Hosting a dinner with friends.”

Table 8 shows the correlation between the sociability factors. The sociability factors showed generally low correlations with each other. Social desire, in particular, only showed a significant correlation with shyness.

Table 7

Factor loadings for the new sociability items. This factor analysis produced 7 factors: 5 new sociability factors plus the existing factors of shyness and social enjoyment.

Statement	Rating Scale	Shyness	Strong Ties Effort	Social Desire	Networking Effort	Weak Ties	Strong Ties Tendency	Social Enjoyment
I am socially somewhat awkward.	Agreement	**-.75**	.07	.06	-.01	-.08	-.01	-.08
I don't find it hard to talk to strangers.	Agreement	**.55**	-.08	.02	.08	.12	.08	.06
I feel tense when I'm with people I don't know well.	Agreement	**-.72**	-.02	.03	.01	-.01	.06	-.08
When conversing I worry about saying something dumb.	Agreement	**-.84**	-.03	-.06	-.00	.04	-.04	.09
I feel nervous when speaking to someone in authority.	Agreement	**-.72**	-.04	.06	.03	.08	.01	.03
I am often uncomfortable at parties and other social functions.	Agreement	**-.71**	-.00	.07	-.02	-.06	.06	-.19
I feel inhibited in social situations.	Agreement	**-.75**	-.00	.01	-.06	-.03	.03	-.18
I have trouble looking someone right in the eye.	Agreement	**-.59**	.05	.05	.05	-.05	-.15	-.13
I am more shy with members of the opposite sex.	Agreement	**-.51**	-.03	.11	-.00	-.05	-.02	.06
I like to be with people.	Agreement	.09	.08	.02	.00	.04	.07	**.76**

I welcome the opportunity to mix socially with people.	Agreement	.20	-.02	.03	-.07	.02	.01	**.61**
I prefer working with others rather than alone.	Agreement	.03	-.06	.09	-.05	-.02	-.07	**.73**
I find people more stimulating than anything else.	Agreement	-.01	.02	-.02	.03	.04	-.01	**.79**
I'd be unhappy if I were prevented from making many social contacts.	Agreement	-.09	.02	.01	-.03	-.01	.04	**.68**
I wish I was closer to my friends	True of me	-.04	.00	**.68**	.01	-.03	.07	-.02
I wish I was more popular	True of me	-.06	-.03	**.72**	-.07	.01	-.05	.04
I would like to be more attractive to others	True of me	-.13	-.08	**.60**	.04	.03	.07	-.09
I would like to have more respect from others	True of me	-.14	-.07	**.48**	-.01	.04	-.05	-.10
I would like my interactions with others were more pleasant	True of me	-.15	.08	**.45**	.06	-.06	-.05	-.11
When you buy groceries, talking to your cashier	Likelihood	.09	-.21	-.06	.06	**.59**	.25	.09
During a cab ride, talking to your cab driver	Likelihood	.18	-.20	-.05	.04	**.58**	.17	.05
Smiling at people on the street	Likelihood	.10	-.13	-.01	.00	**.47**	.22	-.03
Striking up a conversation with someone you see frequently but have not spoken to	Likelihood	.12	-.17	-.09	-.01	**.43**	.20	.12

When you buy groceries, talking to your cashier[1]	Effort	-.07	.28	.02	.01	**.74**	-.14	.05
During a cab ride, talking to your cab driver[1]	Effort	.08	.12	.03	-.12	**.65**	-.15	.05
Smiling at people on the street[1]	Effort	-.05	.32	.07	-.00	**.44**	-.05	-.02
Striking up a conversation with someone you see frequently but have not spoken to[1]	Effort	-.08	.18	-.00	-.36	**.45**	.07	.09
Going out to eat with close friends	Likelihood	.01	.08	-.03	.05	-.01	**.45**	.10
Having coffee with a friend	Likelihood	.03	.11	.03	-.03	-.00	**.50**	.04
Comforting a friend when they are experiencing difficulties	Likelihood	.00	.16	-.01	-.13	.01	**.66**	.05
Doing a friend a favor	Likelihood	.10	.15	.03	-.12	.02	**.74**	.04
Going to a party where you did not know anyone	Effort	-.02	-.27	.01	**-.80**	.05	.00	.12
Going to a networking event	Effort	-.05	-.07	.01	**-.86**	-.01	.11	.03
Joining a new social group	Effort	.01	-.00	.04	**-.83**	-.01	.07	.01
Going out to eat with a group of acquaintances[1]	Effort	.08	**.46**	.12	-.32	.11	.04	-.05
Keeping in touch with old friends	Effort	-.01	**.45**	.04	-.12	.03	.02	-.01

Going out to eat with close friends	Effort	.01	**.80**	-.04	.01	.00	-.03	.00
Going to a party with friends	Effort	.05	**.55**	.03	-.25	.08	-.06	.03
Having coffee with a friend	Effort	-.09	**.75**	.03	.07	.13	.11	.06
Comforting a friend when they are experiencing difficulties	Effort	-.02	**.78**	-.09	.10	-.02	.22	.04
Doing a friend a favor	Effort	.03	**.80**	.02	.14	.09	.10	-.02

Note. Factor loadings >.40 are in boldface

[1] These items were removed due to poor model fit in the confirmatory factor analysis. See Table 9 for model fit statistics with and without these items

Table 8

Correlation between sociability factors for Time 1 measures

	1	2	3	4	5	6	7
1. Shyness	-						
2. Social Enjoyment	-.540**	-					
3. Social Desire	.410**	.056	-				
4. Weak Ties	-.430**	.408**	-.066	-			
5. Strong Ties Effort	-.082	.147**	.052	.374**	-		
6. Networking Effort	-.190**	.365**	.093	.364**	.200**	-	
7. Strong Ties Tendency	-.396**	.425**	-.054	.438**	.429**	.297**	-

**$p <$ 0.01

Confirmatory Factor Analysis

Many factor structures for loneliness have been proposed. The R-UCLA loneliness scale has been treated as one factor (Russell et al., 1980), two factors (Joiner, Catanzaro, Rudd, & Rajab, 1999), three factors (Hawkley et al., 2005), and as one factor with two method factors (Russell, 1996). In the method factor model, there is one loneliness factors alongside one factor of positively worded items and one factor of negatively worded items. We used confirmatory factor analysis to test the model fit of these models. Table 9 presents the result for Time 1 and Time 2. We focus on Time 2 because Time 1 data were used for the exploratory factor analysis, although the interpretation remains the same across Time 1 and 2. The 3 factor model had superior fit to the 1 or 2 factor model. The 2 factor model divides items into Lack of Pleasurable Engagement and Painful Disconnection (Joiner et al., 1999). This could reflect responses to item wording because Lack of Pleasurable Engagement items are negatively worded and reverse scored (e.g. “I can find companionship when I want to”), whereas Painful Disconnection are positively worded (e.g. “I feel left out”) and are not reverse scored (Russell, 1996). The 3 factor model divides loneliness into collective disconnection, relational disconnection, and isolation. The 3 factor model is similar to the 2 factor model with Painful Disconnection becoming Isolation and Lack of Pleasurable Engagement

dividing into Collective Disconnection and Relational Disconnection. Collective disconnection reflects poor group ties, relational disconnection reflects poor interpersonal ties, and isolation reflects the subjective sense of isolation. The 3 factor model had somewhat poor fit. Allowing error terms for items within the same factor to covary provided reasonable fit to this modified 3 factor model.

We also performed a confirmatory factor analysis on the new 7 factor sociability scale. Table 9 shows the model fit of these analyses. These analyses revealed that model fit was greatly reduced when some items were included in the model. We used AIC (Akaike Information Criterion) to compare the fit of the sociability scale when some items were removed. Table 9 shows that removing some items greatly improved model fit, indicated by the lower AIC of these models. For the Weak Ties factor, four items that tapped effort reduced model fit, so we retained the four items that reflected tendency to engage with weak ties. The item "Going out to eat with a group of acquaintances" also was reducing model fit and was removed. This item loaded onto the Strong Ties Effort factor in the exploratory factor analysis but did not have face validity for this factor, further justifying its removal. Table 7 lists the items that were removed. We correlated error terms of the items within the same factor and this further improved fit to an acceptable level.

All the factors had adequate internal consistency: Social desire ($\alpha = .86$), Weak ties ($\alpha = .86$), Strong Ties Effort ($\alpha = .90$), Networking Effort ($\alpha = .90$), Strong Ties Tendency ($\alpha = .86$), Shyness ($\alpha = .83$), and Social enjoyment ($\alpha = .88$).

Table 9

Dimensionality of sociability and loneliness

Model	χ^2	df	p	CFI	TLI	RMSEA	SRMR	AIC
Time1 Loneliness								
Method Factors	530.32	150	.000	.93	.92	.08	.05	
1 Factor	1427.61	170	.000	.78	.75	.14	.08	
2 Factor	1367.59	169	.000	.79	.76	.14	.08	
3 Factor	736.35	167	.000	.90	.89	.01	.07	
3 factor modified	550.25	157	.000	.93	.92	.08	.06	
Sociability								
7 Factor	2603.20	798	.000	.82	.81	.08	.09	2813.20
7 Factor removed items	1510.91	608	.000	.90	.89	.06	.07	1700.91
7 factor modified	1256.46	602	.000	.93	.92	.06	.07	1458.46
Time2 Loneliness								
Method Factors	636.27	150	.000	.92	.83	.01	.05	

1 Factor	1559.32	170	.000	.76	.73	.15	.08	
2 Factor	1466.31	169	.000	.78	.75	.15	.08	
3 Factor	920.70	167	.000	.87	.85	.11	.07	
3 factor with modification	689.85	157	.000	.91	.89	.10	.07	
Sociability								
7 Factor	2989..95	798	.000	.79	.77	.09	.10	3199.95
7 Factor removed items	1645.61	607	.000	.88	.87	.07	.07	1837.61
7 factor modified	1284.65	596	.000	.92	.91	.06	.07	1498.65

Metric Analysis

Table 10 shows the results of the metric analysis. Metric invariance examines whether the constructs have the same meaning over time and is considered a prerequisite for cross-lagged models (Little et al., 2007). Metric invariance occurs when items load onto factors with very similar loadings between Time 1 and 2. Metric invariance can be determined by holding the loading of items constant across time and examining the effect on model fit (Chen, 2007). In a loadings invariant model, the loading of the loneliness time 1 items on the loneliness time 1 factor is constrained to equal the loadings of the loneliness time 2 items on the loneliness time 2 factor. If the constrained loading model has similar fit to the loadings free loadings model, this shows that the loneliness items are loading on their factor similarly across time 1 and 2, and metric invariance is demonstrated. As shown in Table 10, for all factors, metric invariance was demonstrated. In the cases where model fit was reduced, other fit indices were still well within recommended cut-offs (such indices account for the improvement in greater parsimony in constrained models). Although the chi square difference was significant for social enjoyment and strong ties tendency, we rely on changes in CFI and RMSEA to indicate measurement invariance because trivial discrepancies in the models can affect chi square changes when sample sizes are large (Chen, 2007).

Table 10

Measurement Invariance Analyses

Sociability/Loneliness	χ^2	df	p	TLI	CFI	RMSEA	SRMR
Shyness							
Free Loadings	286.66	121	.000	.96	.972	.061	.04
Loadings invariant	291.73	129	.000	.97	.972	.059	.04
Model Difference	5.07	8	.749		.000	-.002	
Social Enjoyment							
Free Loadings	53.60	29	.004	.98	.990	.048	.03
Loadings invariant	65.93	33	.001	.98	.986	.052	.03
Model Difference	12.33	4	.015		-.004	+.004	
Social Desire							
Free Loadings	189.58	45	.000	.92	.947	.094	.05
Loadings invariant	192.05	50	.000	.93	.948	.089	.05
Model Difference	2.47	5	.782		+.001	-.005	
Weak Ties							
Free Loadings	78.53	15	.000	.94	.970	.108	.04
Loadings invariant	82.29	18	.000	.95	.969	.099	.03
Model Difference	3.76	3	.288		-.001	-.009	
Strong Ties Effort							
Free Loadings	318.30	45	.000	.86	.902	.130	.05
Loadings invariant	323.44	50	.000	.87	.902	.123	.05

Model Difference	3.14	5	.677		.000	-.007	
Strong Ties Tendency							
Free Loadings	46.60	13	.000	.96	.982	.085	.04
Loadings invariant	57.96	16	.000	.96	.977	.085	.04
Model Difference	11.36	3	.010		-.005	.000	
Networking Effort							
Free Loadings	9.61	5	.087	.99	.997	.050	.02
Loadings invariant	9.68	7	.208	1.00	.998	.032	.02
Model Difference	0.07	2	.976		+.001	-.018	
Collective Disconnection							
Free Loadings	78.15	29	.000	.97	.978	.068	.03
Loadings invariant	81.81	33	.000	.97	.978	.064	.03
Model Difference	3.66	4	.454		.000	-.004	
Isolation							
Free Loadings	377.82	145	.000	.95	.962	.067	.04
Loadings invariant	386.49	154	.000	.95	.962	.065	.04
Model Difference	8.68	9	.468		.000	-.002	
Relational Disconnection							
Free Loadings	37.48	21	.014	.99	.995	.047	.02
Loadings invariant	38.52	25	.041	.99	.996	.039	.02
Model Difference	1.04	4	.904		+.001	-.008	

Cross-lagged analysis

Table 11 shows the lagged effects between aspects of sociability and aspects of loneliness that resulted from the model shown in Figure 6. If the social desensitization model is supported, greater loneliness will lead to less sociability. This was supported by the finding that relational disconnection predicted lower social desire, and that isolation predicted less strong ties tendency. The social pain model, on the other hand, would predict greater loneliness to lead to more sociability. This was supported by the findings that isolation predicted more social desire, collective disconnection predicted more social enjoyment, and collective disconnection predicted more networking effort. Few aspects of sociability were reducing loneliness over time. Shyness was increasing isolation and strong ties tendency was reducing isolation. However sociability was also increasing loneliness over time. Strong ties tendency predicted greater relational disconnection over time. These results show some support for social desensitization and social pain models, but show mixed support for the proposition that sociability reducing loneliness.

The cross-lagged analysis presents the significance levels of several pathways, which raises concerns about multiple comparisons and inflated Type 1 error rates. A Bonferroni correction, which controls the overall Type 1 error rate to be 5% is one way to deal with this concern, yet many researchers have argued against this approach because it is too conservative and increases the rate of Type 2 errors (Fiedler, Kutzner, & Krueger, 2012; Perneger, 1998). We used a limited Bonferroni correction based on false discovery concerns, derived from our theoretical predictions (Benjamini & Hochberg, 1995). We had theoretical justification for hypothesising that sociability reduces loneliness. Furthermore, each effect of sociability reducing loneliness that is not statistically significant reduces confidence in this overall hypothesis. The same is true for loneliness affecting sociability. However, we do not have a theoretical reason why one loneliness factor should behave differently from another loneliness factors so we controlled for the loneliness factors. We therefore used a Bonferroni correction for three comparisons. This correction made the relationship between collective disconnection and networking effort and between isolation and strong ties tendency not significant.

Table 11

Cross-lagged effects between sociability and loneliness

Effect			Estimate	p
Relational Disconnection	→	Shyness	.015	.729
Shyness	→	Relational Disconnection	-.032	.197
Relational Disconnection	→	Social Enjoyment	.019	.665
Social Enjoyment	→	Relational Disconnection	.046	.120
Relational Disconnection	→	Social Desire	**-.113**	**.003***
Social Desire	→	Relational Disconnection	-.053	.239
Relational Disconnection	→	Weak Ties	-.070	.112
Weak Ties	→	Relational Disconnection	.055	.079
Relational Disconnection	→	Strong Ties Effort	.061	.263
Strong Ties Effort	→	Relational Disconnection	.068	.057
Relational Disconnection	→	Strong Ties Tendency	.046	.335
Strong Ties Tendency	→	Relational Disconnection	**.100**	**.009***
Relational Disconnection	→	Networking Effort	.019	.722
Networking Effort	→	Relational Disconnection	.043	.112
Shyness	→	Collective Disconnection	.055	.080
Collective	→	Shyness	-.129	.062

Disconnection				
Collective Disconnection	→	Social Enjoyment	**.196**	**.012***
Social Enjoyment	→	Collective Disconnection	.052	.209
Collective Disconnection	→	Social Desire	-.065	.099
Social Desire	→	Collective Disconnection	.021	.580
Collective Disconnection	→	Weak Ties	.002	.971
Weak Ties	→	Collective Disconnection	.025	.480
Collective Disconnection	→	Strong Ties Effort	.054	.312
Strong Ties Effort	→	Collective Disconnection	.050	.131
Collective Disconnection	→	Strong Tend	.077	.230
Strong Ties Tendency	→	Collective Disconnection	.074	.063
Collective Disconnection	→	Networking Effort	**.167**	**.024**
Networking Effort	→	Collective Disconnection	.000	.988
Isolation	→	Shyness	.014	.721
Shyness	→	Isolation	**.075**	**.008***
Isolation	→	Social Enjoyment	-.009	.803
Social Enjoyment	→	Isolation	-.042	.174
Isolation	→	Social Desire	**.122**	**.000***
Social Desire	→	Isolation	.095	.082
Isolation	→	Weak Ties	.033	.368

Weak Ties	→	Isolation	-.064	.052
Isolation	→	Strong Ties Effort	-.030	.434
Strong Ties Effort	→	Isolation	-.062	.112
Isolation	→	Strong Ties Tendency	**-.074**	**.049**
Strong Ties Tendency	→	Isolation	**-.129**	**.000***
Isolation	→	Networking Effort	-.025	.618
Networking Effort	→	Isolation	-.048	.090

Note. Estimates with $p < .05$ are shown in boldface * $p < .017$ Bonferroni correction for three comparisons.

Table 12 presents the cross-lagged relationships between the sociability factors and loneliness treated as a single factor. Loneliness reduced social desire, and the tendency to engage with strong ties increased loneliness.

Table 12

Cross-lagged effects between sociability and a unitary factor of loneliness

Effect			Estimate	p
Loneliness	→	Shyness	.015	.729
Shyness	→	Loneliness	-.032	.197
Loneliness	→	Social Enjoyment	.026	.575
Social Enjoyment	→	Loneliness	.081	.313
Loneliness	→	Social Desire	**-.124**	**.001***
Social Desire	→	Loneliness	-.016	.479
Loneliness	→	Weak Ties	-.038	.387
Weak Ties	→	Loneliness	.029	.101
Loneliness	→	Strong Ties	.043	.346

		Effort		
Strong Ties Effort	→	Loneliness	.037	.070
Loneliness	→	Strong Ties Tendency	.085	.072
Strong Ties Tendency	→	Loneliness	**.065**	**.003**
Loneliness	→	Networking Effort	.056	.353
Networking Effort	→	Loneliness	.023	.119

Note. Estimates with $p < .05$ are shown in boldface

Discussion

Loneliness is thought to result from low sociability (Cacioppo & Patrick, 2008). This idea is supported by evidence that sociability, measured as enjoyment around others, strongly correlates with lower loneliness (D. M. T. Clark et al., 2015b); however, this correlation could result from loneliness reducing sociability, sociability reducing loneliness, or a third factor affecting loneliness and sociability. Furthermore, there may be different types of sociability that have different relationships with loneliness. To address these issues, we measured various aspects of sociability at two time points. Using exploratory factor analysis, we found that different types of sociability could be distinguished from the existing measures of enjoyment around others and shyness. The new types of sociability that we found were the desire for social belonging, the tendency to engage with strong ties, the effort to engage with strong ties, the effort put into networking, and the tendency to engage with weak ties. Furthermore, each of these factors of sociability showed a different relationship with loneliness over time. Some forms of sociability reduced loneliness, whereas loneliness increased some forms of sociability, while reducing other forms of sociability, supporting both the pain and social desensitization models.

We found some support for the social pain model. The social pain model argues that loneliness evolved as an alarm system, designed to motivate behaviour that promotes adequate belonging (Cacioppo & Patrick, 2008). The social pain model expects that lonely people should put more effort into reconnecting and therefore show more sociability. We found three cross-lagged relationships that supported the social pain model. One, collective disconnection, the type of loneliness associated with group ties, led to more social enjoyment. Two, collective disconnection

led to more networking effort, although this was not significant after a Bonferroni correction. Three, isolation, the subjective feeling of loneliness, increased social desire. Loneliness led people to enjoy company more and to desire social connection more.

We found some support for the social desensitization model. The social desensitization model argues that lonely people become desensitized to belonging and therefore predicts that loneliness will lead to less sociability (Moller et al., 2010). We found two cross-lagged relationships that supported the social desensitization model. One, relational disconnection, the type of loneliness associated with interpersonal ties, led to less social desire. Two, isolation led to less tendency to engage with strong ties, although this was not significant after a Bonferroni correction. Loneliness led people to desire social connection less.

Another question we tested was whether sociability reduced loneliness. Loneliness is often thought to result from low sociability as seen in the advice to lonely people, which boils down to advice to be more social (e.g. Cacioppo & Patrick, 2008; Loe, 2012; Rosenberg, 2014). Despite the intuitive appeal of sociability reducing loneliness, we found only some mixed support for this idea. Some forms of sociability did reduce loneliness over time. The tendency to engage with strong ties did reduce isolation. Low levels of shyness, which is closely related to sociability, reduced feelings of isolation. In contrast, one form of sociability actually increased loneliness, directly contradicting the idea that loneliness results from low sociability. The tendency to engage with strong ties led to more relational disconnection.

The current study explored how loneliness would relate to social desire and enjoyment. Neural research, particularly studying addiction, has found that desire and enjoyment are distinct systems that can diverge (Berridge & Robinson, 1995). Mirroring this distinction, the factor analysis of the current study found that social enjoyment and social desire were separate factors. We examined how social desire and social enjoyment would relate to loneliness. We hypothesized that loneliness would increase desire and reduce enjoyment based on research showing being denied something increases desire but reduces enjoyment (Litt et al., 2009). This hypothesis was only partially supported. Supporting the hypothesis, isolation increased social desire. Contradicting the hypothesis, relational disconnection reduced social desire and collective disconnection increased social enjoyment. Desire and enjoyment can be distinguished in the domain of loneliness in the same way that desire and enjoyment can be distinguished more broadly in human motivation; however the effect of deprivation on desire and enjoyment do not appear to translate from broad human motivation to loneliness.

The results of this study are consistent with previous findings on the relationships between sociability and loneliness but challenge existing assumptions surrounding the temporal relationship between sociability and loneliness. We replicated previous research that found the shyness

longitudinally predicts higher loneliness (Cheek & Busch, 1981). The previous finding looked at loneliness generally, whereas we found that shyness predicted increased isolation but not increased relational or collective disconnection. Despite strong negative cross-sectional relationship between social enjoyment and loneliness, the only cross-lagged relationships between social enjoyment and loneliness was collective disconnection leading to greater social enjoyment, which is in the opposite direction to the negative cross-sectional relationship between loneliness and social enjoyment. These findings strongly suggest a strong third variable that reduces loneliness and increases social enjoyment. Such as third variable is likely to be cognitive, affecting an individual's perception of the social situation (e.g. Wilbert & Rupert, 1986).

The results of this study report the relationship between sociability and loneliness, divided into relational disconnection, collective disconnection, and isolation. However, a major model of loneliness divides loneliness into emotional loneliness (a lack of close interpersonal relationships) and social loneliness (a lack of casual relationships with others) (R. S. Weiss, 1973). Although social and emotional loneliness are distinguishable, they relate equally to the R-UCLA loneliness scale (Russell, Cutrona, Rose, & Yurko, 1984). Russell et al (1984) report the items of the R-UCLA that correlate with measures of social and emotional loneliness. Examining the items reveals that items that correlate with emotional loneliness are all items within the relational disconnection factor and items that correlate with social loneliness are all items within the collective disconnection factor. In the context of the current paper's results, emotional loneliness is more likely to lead to social desensitization, whereas social loneliness is more likely to lead to social pain.

Implications

The results cast doubt on the advice to lonely people to be more sociable. Lonely people are advised to join groups, create social groups, reach out to neighbours, and be open (e.g. Loe, 2012; Rosenberg, 2014). The current results find that although lonely people are less social than others, it is not their sociability that is causing their loneliness. Social enjoyment, as the previously established measure of sociability, did not reduce loneliness over time, despite having a strong cross-sectional relationship. Furthermore, most facets of sociability did not reduce loneliness over time, including social desire, strong ties effort, and networking effort. In fact, we found some negative impacts of sociability on loneliness, finding that effort for strong ties predicted feeling less relational belonging over time.

The advice of people to be more social appears to be based on the assumption that sociability would improve social networks and that social networks reduce loneliness. This assumption is challenged by the literature examining the nature of the relationship between social network variables and loneliness. One social network variable, the number of people a person feels close to, is a weak predictor of lower loneliness, whereas, another social network variable, the (in

dense networks an individual's friends all know each other), is a strong predictor of lower loneliness (Stokes, 1985). The relationship between social networks and loneliness is complicated by the fact that different people have different expectations of their relationships (Peplau & Perlman, 1979). Loneliness is more closely related to the discrepancy between a person's ideal and actual number of close friends (Russell et al., 2012). Sociability may relate to a person's ideal number of close friends, yet we did not examine this in a current study. Future research should examine how sociability relates to loneliness, the ideal number of close friendships, and the actual number of close friendships.

Another issue with the assumption that sociability would reduce loneliness through improving social networks is that evaluation of social networks can be highly subjective. People may have different ideas of friendship and what counts for a close relationship (Fischer, 2011). People's evaluation of their social networks may be biased by maladaptive cognition. Maladaptive cognition is a strong predictor of loneliness (Wilbert & Rupert, 1986), and a meta-analysis of interventions to reduce loneliness found that intervention that targeted maladaptive cognitive were superior to interventions that addressed social support or social skills (Masi, Chen, Hawkley, & Cacioppo, 2011). Maladaptive cognition may influence more subjective elements of social networks, such as perceived quality, rather than more objective elements of social networks, such as frequency of interactions. Furthermore, people's evaluation of the quality of their relationships rather than their evaluation of frequency of interactions is more important to their physical and psychological health (Reis et al., 1985).

Limitations

The longitudinal nature of the study allows greater confidence in the temporal relationship between sociability and loneliness, yet a weakness of the study is the relatively short time lag between the questionnaires. The time lag between the two questionnaires was 7 weeks. The short time frame means any change that takes over 7 weeks to have an effect would be undetected by this study. The study, however, was able to find many effects between loneliness, sociability, and shyness, showing that 7 weeks is enough time for many relationships between sociability, shyness, and loneliness to emerge. A limitation is that the current participants were not going through a transition. Longitudinal studies tend to study people going through a transition, such as college students, because longitudinal studies rely on changes occurring between the time points. Another limitation was that the study did not use a newer version of the UCLA loneliness scale (Russell, 1996), which was created to address problems with confusing items in the earlier scale.

The development of the new sociability scale was a limitation. The confirmatory factor analysis and the exploratory factor analysis were conducted on the same sample, which inflate the fit statistics of the scale. This limitation is not allayed by the confirmatory factor analysis being

done on the two time points because, although the second time point is a new sample, it is not a completely independent sample.

Another limitation was that this study did not examine the distinction between social and emotional loneliness, although these may affect how people pursue belonging. Social loneliness reflects a lack of casual relationships, whereas emotional loneliness reflects a lack of intimate relationships (R. S. Weiss, 1973). People experiencing the different forms of loneliness may be sociable in different ways.

Future directions

Further exploration of the link between sociability and loneliness is warranted. Future longitudinal studies could utilize a longer lag between measurements and a sample going through a transition, such as college students. As mentioned previously, such a study should measure the discrepancy between actual and desired relationships. Future studies could look at how loneliness is affected by experimentally inducing sociability. Studies have examined how interventions that ask people to act more extraverted, to talk to their barista, or to talk to people on trains influence people's affect (Epley & Schroeder, 2014; Fleeson, Malanos, & Achille, 2002; Sandstrom & Dunn, 2014). Future work could also examine within person variability in sociability to see if loneliness is less on days that people are more social.

The current results suggest further examination of why shyness predicts loneliness is warranted. The current study measured many aspects of sociability, and many of these aspects would presumably be why shyness predicts loneliness. We can therefore rule out an explanation that shyness affects loneliness because shy people are less likely to join clubs, make contact with weak ties or make an effort with their strong ties. Shyness may impact loneliness through variables not captured by the sociability scales such as having low levels of eye contact and having low levels of self-disclosure.

Conclusion

We examined sociability and loneliness at two time points to test the social pain model, the social desensitization model, and whether sociability reduces loneliness. We found some support for the social pain model, which predicts that loneliness should lead to greater sociability. We found that collective disconnection led to more social enjoyment and more networking effort, and isolation led to more social desire. We also found some support for the social desensitization model, which predicts that loneliness should lead to less sociability. We found that relational disconnection led to less social desire and isolation led to less tendency to engage with strong ties. We found little support for the idea that loneliness is the result of low sociability. Although, lonely people are less social, the results of the current longitudinal study suggest that low sociability is not a major cause of loneliness. Although the tendency to engage with strong ties reduced isolation and shyness

increased isolation, most forms of sociability had no cross-lagged impact on loneliness, and effort with strong ties actually increased relational disconnection. The inconsistent results of sociability suggest that sociability is a poor way to pursue belonging and lonely people may need alternatives.

Chapter 5

The previous 3 chapters examined the pursuit of belonging through sociability. In Chapter 5, we examine whether people can pursue belonging by being valuable to others, which they may accomplish through engagement at work.

The Pursuit of Belonging Through Work

Loneliness is a subjective sense of isolation and is associated with depression, poor sleep quality, suicide, and poor physical health (Cacioppo et al., 2002; Holt-Lunstad et al., 2010; Stravynski & Boyer, 2001; Wilbert & Rupert, 1986). Loneliness is thought to be the result of poor quality relationships, and the pursuit of belonging has focussed on increasing sociability (Cacioppo & Patrick, 2008; R. S. Weiss, 1973). In contrast, we argue belonging can result from feeling that one is valuable to others, not just value to a relationship, but value to society, which can derive from the value produced from work. Therefore, we argue people can pursue belonging through work and that work engagement increases belonging. An association between belonging and engagement has been found, yet this has been interpreted as belonging leading to engagement (Good, Rattan, & Dweck, 2012). We argue that belonging leads to engagement and engagement leads to belonging in a reciprocal relationship. People may also turn to work, when lonely, to bolster their feeling of belonging. To investigate whether belonging and engagement have this reciprocal relationship, and whether people would pursue belonging through work, we conducted a cross-lagged study measuring work engagement and belonging at two time points three months apart.

Expanding the Scope of Belonging to Work

Many different researchers have echoed similar definitions of loneliness that include the broad themes of deficiencies in one's relationships and a subjective sense of isolation that is unpleasant (Peplau & Perlman, 1982). Weiss (1973), for instance, defined loneliness as an absence of satisfying relationships, and De Jong-Giverveld (1978) defined loneliness as the difference between desired and realised relationships. The opposite of loneliness—belonging —is also linked strongly to relationships, and is thought to require pleasant interactions in the context of mutual caring (Baumeister & Leary, 1995). The initial conception of belonging focused on interpersonal relationships, although it was later expanded to include group level connection (Baumeister & Sommer, 1997).

The definition of loneliness as reflecting relationship quality implies a strong relationship between feelings of loneliness and social networks. However, the relationship between social networks and loneliness is mixed. The size of social networks does not appear to be an important factor for predicting loneliness (Stokes, 1985). Quality of interaction is more important for health outcomes than frequency of interaction (Reis et al., 1985), yet companionship is more consistently related to lower loneliness than emotional or instrumental support (Rook, 1987). The strongest predictor of loneliness among various social network variables was that lower loneliness variables was associated with higher network density—in dense networks each person knows one another, whereas in less dense networks each person's friends are not acquainted (Stokes, 1985). However, it is not necessarily social networks, but the relationship between social networks and expectations of

social networks that should predict loneliness (Peplau & Perlman, 1979). This contention is supported by empirical work; the difference between actual and ideal friendships is a strong predictor of loneliness (Russell et al., 2012).

A broader conception of belonging is suggested by evidence that belonging is affected by variables distinct from social networks. Belonging is increased by smiles from a stranger (Wesselmann et al., 2012). Belonging is challenged by rejection from a despised outgroup, such as the KKK (Gonsalkorale & Williams, 2007), and by rejection from a computer (Zadro, Williams, & Richardson, 2004). The manipulations in these studies did not affect the participants' social networks, interpersonal relationships, group relationships, social support, quality of relationships, yet their feeling of connection is being affected by something that does not seem to be relevant to their social networks: strangers, disliked outgroups, and computers. Furthermore, over the past few decades, high school students in America are reporting poorer social networks, yet, at the same time, are reporting less loneliness (D. M. T. Clark et al., 2015a).

Belonging beyond social network variables is also suggested by examining the evolutionary basis of belonging. It is widely recognized that belonging has evolutionary origins (Axelrod & Hamilton, 1981; Baumeister & Leary, 1995; Buss, 1990). The desire to create and maintain interpersonal bonds has survival and reproductive benefits (Seyfarth & Cheney, 2012). Female baboons who form strong interpersonal relationships live longer (Silk et al., 2010), and their infants are more likely to survive (Silk et al., 2009). Similar results occur with dolphins. Dolphins with stronger interpersonal bonds are more likely to have their infants survive (Frère et al., 2010).

However, there are survival benefits beyond interpersonal ties. Cooperation can emerge through indirect reciprocity; people who have a reputation for being helpful are more likely to receive help from people even if they lack any direct interaction with that person (Nowak & Sigmund, 2005). Therefore, the need to belong should not only motivate a desire for interpersonal bonds but also motivate a desire for a good reputation. The link between cooperation and the evolution of the need to belong was discussed by Tooby and Cosmides (1996), who argued people want to be important to others to ensure that they get help when they are in need. Tooby and Cosmides framed this argument in terms of interpersonal relationships but we propose that their argument extends to the group level and the tribe/society level. A person who is valuable to their tribe should be more likely to gain help from their tribe; therefore, the need to belong should be sensitive to importance to others generally.

How valuable a person is to others is not just about whether they will cooperate but also about their ability to cooperate. This mirrors interpersonal perception; people primarily perceive others in terms of warmth and competence—how friendly they are and how able they are (Fiske, Cuddy, & Glick, 2007). Studies show that people are sensitive to status and competence in

cooperative contexts. Primates are more likely to groom those of high status (Schino, 2001), and grooming is known to lead to alliances (Schino, di Sorrentino, & Tiddi, 2007). Similar results have been shown with humans. When researchers sent Christmas cards to anonymous strangers, the strangers were more likely to reciprocate by sending a Christmas card or letter when the original card was signed by a purported doctor (Kunz & Woolcott, 1976). Thus, belonging should fuel a desire for competence or status.

Belonging and Cultural Domains

Links between competence and belonging have been demonstrated. Steele (1997) argued that feelings of belonging can be reduced by stereotypes of low competence. Belonging can reflect skill in important cultural domains; for instance, math belonging is defined as the sense of acceptance and membership in the math domain (Good et al., 2012). Math belonging is predicted by variables unrelated to strict social network variables, but is related to variables associated with competence. Women's math belonging is reduced by the joint influence of the belief that math is a fixed skill, rather than a malleable skill, and the stereotype that women have low math ability (Good et al., 2012). Math belonging is also affected by perception of effort; for women, but not men, math belonging is lowered by the perception that one is making more effort in math than others (J. L. Smith, Lewis, Hawthorne, & Hodges, 2013). In these studies, belonging is affected by variables such as effort perception and math stereotypes, which relate to how math competence is perceived. Ambient belonging has also been identified. Ambient belonging is the feeling that one fits in with an environment (Cheryan, Plaut, Davies, & Steele, 2009). Stereotypical male environments, which include posters of male interests, reduce women's feeling of belonging in computer science (Cheryan et al., 2009). Together these studies suggest that belonging is associated with a sense of competence and engagement with valued cultural domains.

Belonging and Work Engagement

A sense of belonging can derive from cultural domains, such as math belonging. There is also literature demonstrating a contrasting pattern where belonging leads to engagement. Feeling that one fits with one's ethnic group is associated with more engagement at school (Oyserman, Brickman, Bybee, & Celious, 2006). Math belonging predicts women's intention to pursue math (Good et al., 2012). Women, who were exposed to stereotypical male environments (e.g. Star Trek posters), expressed less interest in pursuing a computer science degree (Cheryan et al., 2009). Life guards who were exposed to stories designed to highlight the importance of their work felt that their work was valued by others, and this led them to be more dedicated to their work (Grant, 2008).

The research literature indicates that high belonging can spur engagement, yet we argue that the opposite is also plausible: that low belonging could spur engagement. Loneliness is thought to act like pain where it signals insufficient belonging and motivates reconnection (Cacioppo &

Patrick, 2008). This is normally thought of as spurring efforts to socialize and build interpersonal ties. If, however, people can satisfy the need to belong through work, it follows that loneliness may spur people to engage more with work.

Work engagement can also be determined by satisfaction of psychological needs. Self-determination theory asserts that motivation is determined by the satisfaction of the needs of autonomy, competence, and relatedness (Deci et al., 2001). Autonomy is the motivation to be a causal agent in one's life, competence is the motivation for mastery, and relatedness is the motivation to be connected with others. Employees who have higher autonomy have higher work engagement (Salanova, Agut, & Peiro, 2005). In both the United States and Bulgaria, greater work engagement was predicted by higher satisfaction of the needs of autonomy, competence, and relatedness (Deci et al., 2001).

Current Study

We argued that belonging should reflect not only the desire for interpersonal bonds but the desire to be important according to cultural values. We argue that people can satisfy the desire to be important through work. The more engaged a person is with their work the more they should feel a sense of belonging. People should also pursue belonging through work, implying that low belonging should lead to engagement. Previous research has found the opposite effect that feeling belonging can lead to engagement. Belonging can be split into different factors (Hawkley et al., 2005), and these factors may have different relationships with engagement, accounting for the previous diverging findings of low and high belonging leading to engagement. We hypothesise that both high and low belonging should lead to work engagement and that work engagement should lead to belonging. To test this hypothesis we conducted a cross-lagged panel study whereby the psychological needs (autonomy, relatedness, and competence), work engagement, and loneliness were measured two times three months apart. The cross-lagged model between work engagement and loneliness is presented in Figure 7. We used an existing conception of work engagement where work engagement is defined as a positive state of mind that is work related and consists of dedication, absorption, and vigour (Schaufeli, Bakker, & Salanova, 2006). Dedication is being heavily involved in work, absorption is being engrossed in work, and vigour is feeling energetic at work. Work engagement is positively associated with job performance, customer satisfaction, and financial returns (Schaufeli, Taris, & van Rhenen, 2008; Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2009).

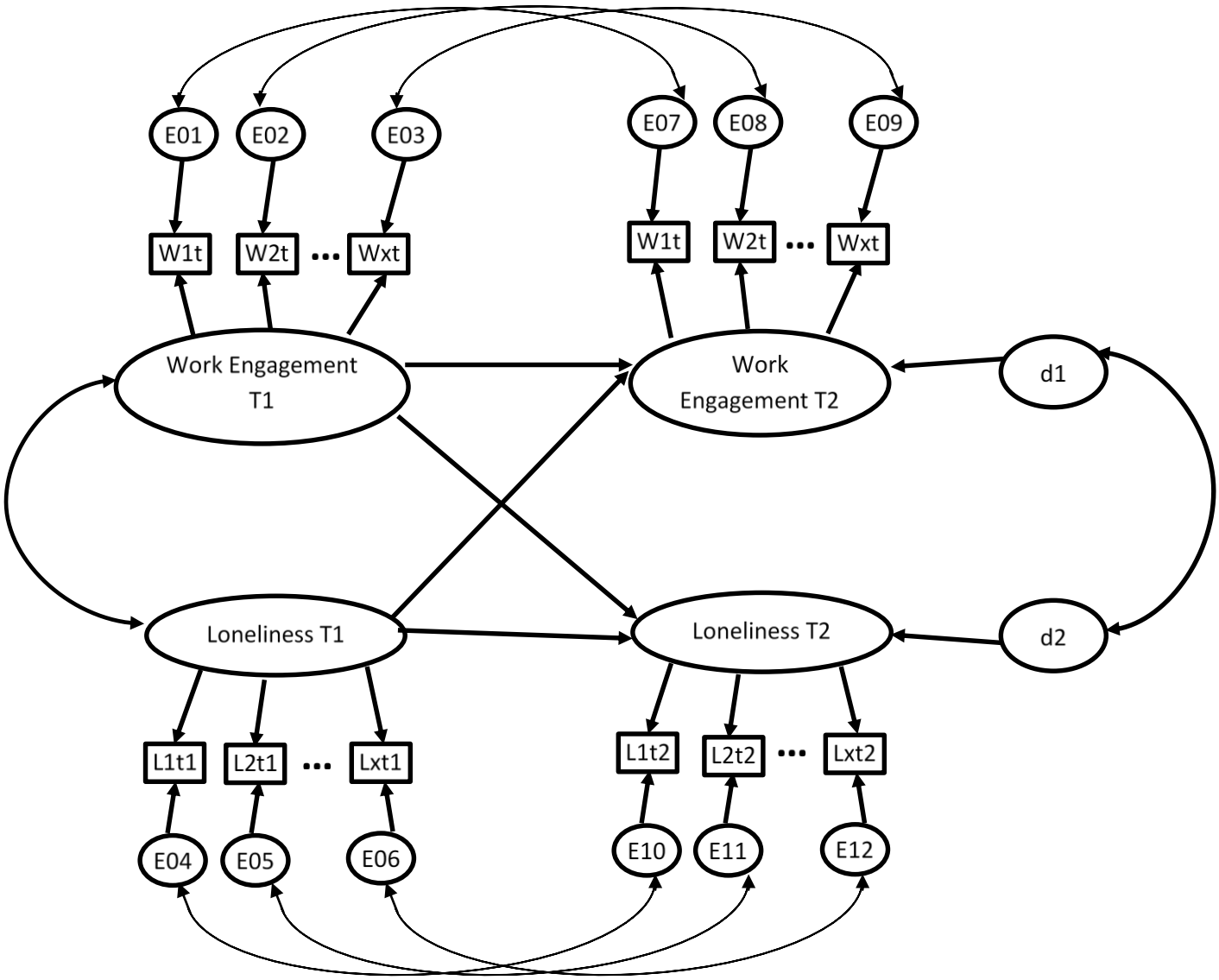

Figure 7. The cross-lagged structural equation model of loneliness and work engagement. The cross-lagged model for psychological needs and work engagement is the same but with psychological needs replacing loneliness. The cross-lagged panel model includes four different types of indicators. One, the correlations between the latent variables at Time 1. Two, the stability of each construct over time. Three, the two cross-lagged effects. Four, the correlation between the disturbances at Time 2. T1 = Time 1; T2 = Time 2; W1t1, W2t1, Wxt1 = items for work engagement at Time 1; W1t2, W2t2, Wxt2 = items for work engagement at Time 2; L1t1, L2t1, Lxt1 = items for loneliness at Time 1; L1t2, L2t2, Lxt2 = items for loneliness items at Time 2; e01-e99 = error variances for the items; d1 = error disturbance for work engagement at Time2; d2 = error disturbance for loneliness at Time 2. The error terms are correlated for each item across Time 1 and 2.

Method

Participants and Procedure

We recruited participants through Amazon's Mechanical Turk. We used a 1-question screening survey that asked how many hours a week the participants worked. Participants who were working over 25 hours a week were assigned a qualification to do the first survey, and we invited them by email to participate. There were 505 participants who completed the first survey. Three months after completing the first survey, we emailed participants to do the study a second time. The two surveys were virtually identical. Responses were matched using their Mechanical Turk ID numbers. 376 participants (74.46%) completed the second survey. Participants were paid $0.05 for completing the screening questions, $0.30 for the first survey, and $0.60 for completing the second survey. We excluded 43 participants for failing the attention screening question, "All my friends say that I would make a good leprechaun." Participants consisted of 182 (54.7%) males and 150 (45.0%) females. One participant did not indicate their gender. The average age was 36.49 (*SD* = 10.24). The sample consisted of 272 (81.7%) Caucasian, 14 (4.2%) African American, 25 (7.5%) Asian, 12 (3.6%) Mixed, and 10 (3.0%) participants of other races. Participants worked an average of 40.27 hours (*SD* = 5.96). The sample contained 61 (18.3%) administrative, 55 (16.5%) service, 123 (36.9%) professional, 37 (11.1%) managerial, 28 (8.4%) retail, and 28 (8.4%) other types of jobs. One participant did not indicate their type of job.

Measures

Work Engagement

We measured work engagement using the Utrecht Work Engagement Scale (Schaufeli et al., 2006). Participants rated how often they had different experiences on a scale from 0 (*never*) to 6 (*every day*). Vigour was measured with items such as, "At my work, I feel bursting with energy." Dedication was measured with items such as, "I find the work that I do full of meaning and purpose." Absorption was measured with items such as, "Time flies when I am working."

R-UCLA loneliness scale

Loneliness was measured with the 20-item revised UCLA loneliness scale (Russell et al., 1980). Participants rated how often they have various experiences on a 4-point scale from 1 (*never*) to 4 (*often*). An example item was, "I feel left out."

Need satisfaction at work

We measured need satisfaction at work using a 21-item scale (Deci et al., 2001). Participants rated their satisfaction of needs from 1 (*not at all true*) to 7 (*very true*). An example of a competence item was, "Most days I feel a sense of accomplishment from working." An example of an autonomy item was, "I feel I can make a lot of inputs into deciding how my job gets done." An example of a relatedness item was, "I really like the people I work with." Relatedness has some

overlap with the loneliness scale, but it is more focussed on the work environment and we argue is more akin to social support than loneliness.

Results

We used structural equation modelling to analyse our data. First, we assessed the factor structure of our constructs. We report standardized root square mean residual (SRMR), the root-mean-square error of approximation (RMSEA), the comparative fit index (CFI), and the Tucker–Lewis index (TLI). We report these measures because they perform well in simulation studies and are reported frequently (Hu & Bentler, 1998; Lang et al., 2011). For these measures, various cut offs have been suggested. For RMSEA, values below .08 indicate reasonable fit, whereas values greater than 0.1 indicated poor fit (Browne & Cudeck, 1993). Good fit is indicated by values below .08 for SRMR and .06 for RMSEA, and values above .95 for TLI and CFI (Hu & Bentler, 1998). However, cut-offs should be used with caution (Fan & Sivo, 2007; Marsh et al., 2004; Sharma et al., 2005). Second, we assessed metric invariance, which measured if the meaning of the construct is consistent across time. We assessed metric invariance by holding the loading of the items onto their factors to be equal across time points and examining any changes in fit statistics. For samples over 300, inadequate metric invariance is indicated by Δ CFI $\leq$.-010 and by Δ RMSEA $\geq$ .015 (Chen, 2007). Third, we assessed the structural model presented in Figure 7 to determine the cross-lagged relationship between our variables.

We assessed the factor structure of the scales. The fit of the different scales is shown in Table 13. The revised UCLA loneliness scale has had one (Russell et al., 1980), two (Joiner et al., 1999), and three (Hawkley et al., 2005) factor solutions. As shown in Table 12, the three factor solution provided the best fit to the data. The three factor solution comprises the factors of collective disconnection, relational disconnection, and isolation. The three factor solution, although superior to the two and one factor solutions, still provided poor fit, so we performed modifications by correlating some of the error terms of the items within the same factor. This modification brought the fit to a satisfactory level. Work engagement is comprised of three factors: vigour, dedication, and absorption (Schaufeli et al., 2006). The three factor model for work engagement provided poor fit, but this was improved to a satisfactory level by correlating some error terms of the items within the same factor. Psychological needs are comprised of autonomy, relatedness, and competence (Deci et al., 2001). However, the three factor model of psychological needs provided unsatisfactory fit, regardless of modifications.

Table 13

Dimensionality of loneliness, work engagement, and needs

Model	χ^2	df	p	TLI	CFI	RMSEA	SRMR
Time1							
Loneliness							
1 Factor	1153.58	170	.000	.80	.82	.13	.06
2 Factor	1132.80	169	.000	.80	.82	.13	.06
3 Factor	762.42	167	.000	.88	.89	.10	.06
3 factor modified	565.73	162	.000	.91	.93	.09	.05
Work Engagement							
Unmodified	657.78	116	.000	.86	.88	.119	.06
Modified	427.00	107	.000	.91	.93	.095	.05
Needs							
Unmodified	984.78	186	.000	.75	.78	.11	.00
Modified	626.33	174	.000	.85	.87	.09	.07
Time2							
Loneliness							
1 Factor	1031.14	170	.000	.83	.84	.12	.06
2 Factor	995.19	169	.000	.83	.85	.12	.06
3 Factor	640.05	167	.000	.90	.91	.09	.05
3 factor with modification	499.31	162	.000	.93	.94	.08	.05
Work Engagement							
Unmodified	781.97	116	.000	.84	.86	.13	.07
Modified	502.42	106	.000	.89	.92	.11	.05
Needs							
Unmodified	1131.93	186	.000	.74	.77	.12	.09
Modified	629.70	173	.000	.87	.89	.09	.07

Table 14 shows that competence showed particularly poor fit as a factor on its own. The poor fit of competence appears to be responsible for the poor fit of psychological needs because autonomy and relatedness had adequate fit. Therefore, we did not analyse competence, but we continued to use autonomy and relatedness in subsequent analyses.

Table 14 shows the metric invariance analysis. Metric invariance shows that the meaning of the constructs has remained stable over time. To show measurement invariance we held loadings

constant across the two time points. We held constant the loadings between the Time 1 loneliness factor and first measurement of the first loneliness item with the loading between the Time 2 loneliness factor and the second measurement of the first loneliness item. We do this for every item. If this procedure substantially reduces model fit, measurement invariance has not be established. We used cut-offs from Chen (2007) for samples over 300: inadequate metric invariance is indicated by Δ CFI $\leq$ -.010 and by Δ RMSEA $\geq$.015. As can be seen in Table 14, all factors met these cut-offs. Relatedness had a significant chi square change between the loading invariant and free loadings model; however, we rely on CFI and RMSEA to indicate measurement invariance because trivial discrepancies in the models can affect chi square changes when sample sizes are large (Chen, 2007).

Table 14

Measurement Invariance Analyses

Construct	χ^2	df	p	TLI	CFI	RMSEA	SRMR
Work Engagement							
Absorption							
Free Loadings	154.12	47	.000	.94	.966	.083	.05
Loadings invariant	156.06	52	.000	.95	.961	.078	.05
Model Difference	1.94	5	.857		-.005	-.005	
Dedication							
Free Loadings	67.01	29	.000	.98	.989	.063	.02
Loadings invariant	75.94	33	.000	.98	.988	.063	.02
Model Difference	8.93	4	.063		-.001	.000	
Vigour							
Free Loadings	190.37	43	.000	.92	.948	.102	.06
Loadings invariant	192.23	48	.000	.93	.948	.095	.06
Model Difference	1.86	5	.869		.000	-.007	
Loneliness							
Isolation							
Free Loadings	385.80	145	.000	.94	.956	.071	.04
Loadings invariant	390.99	154	.000	.95	.957	.068	.04
Model Difference	5.19	9	.818		+.001	-.003	
Group Disconnection							
Free Loadings	33.22	29	.269	1.00	.998	.021	.02
Loadings invariant	36.39	33	.314	1.00	.998	.018	.02
Model Difference	3.17	4	.528		.000	-.003	
Interpersonal Disconnection							
Free Loadings	19.64	21	.544	1.00	1.000	.000	.01
Loadings invariant	26.04	25	.406	1.00	1.000	.011	.02
Model Difference	6.40	4	.172		.000	+.011	
Work Engagement							
Autonomy							
Free Loadings	252.32	69	.000	.89	.918	.089	.07
Loadings invariant	256.87	75	.000	.90	.918	.085	.07

Model Difference	4.55	6	.603		.000	-.004	
Relatedness							
Free Loadings	412.13	95	.000	.90	.922	.100	.07
Loadings invariant	433.60	102	.000	.90	.919	.109	.07
Model Difference	21.47	7	.003		-.003	+.009	
Competence							
Free Loadings	255.20	43	.000	.83	.888	.122	.10
Loadings invariant	262.46	48	.000	.85	.887	.116	.10
Model Difference	7.26	5	.202		-.001	-.006	

Table 15 shows the cross-lagged relationship between work engagement, loneliness, and needs. Table 15 shows that collective disconnection led to greater vigour, isolation led to less vigour, and relatedness led to greater vigour. We used the same approach as the previous chapter to control for multiple comparisons. Controlling for multiple comparisons none of the relationships between needs, work engagement, or loneliness were significant.

Table 15

Cross-lagged effects between work engagement, needs, and loneliness

Effect			Estimate	p
Relational Disconnection	→	Dedication	.097	.071
Dedication	→	Relational Disconnection	.026	.397
Relational Disconnection	→	Vigour	.136	.063
Vigour	→	Relational Disconnection	.000	.999
Relational Disconnection	→	Absorption	.098	.145
Absorption	→	Relational Disconnection	.004	.892
Collective Disconnection	→	Dedication	.099	.244
Dedication	→	Collective Disconnection	.029	.207
Collective Disconnection	→	Absorption	.100	.333
Absorption	→	Collective Disconnection	-.007	.761
Collective Disconnection	→	Vigour	**.237**	**.038**
Vigour	→	Collective Disconnection	.007	.772
Isolation	→	Dedication	-.057	.225
Dedication	→	Isolation	-.043	.119
Absorption	→	Isolation	-.045	.071
Isolation	→	Absorption	-.065	.246
Isolation	→	Vigour	**-.129**	**.041**
Vigour	→	Isolation	-.047	.053
Autonomy	→	Dedication	.055	.342
Dedication	→	Autonomy	-.085	.190
Autonomy	→	Absorption	.014	.819
Absorption	→	Autonomy	.004	.931
Autonomy	→	Vigour	-.043	.555
Vigour	→	Autonomy	.010	.859
Relatedness	→	Dedication	.003	.961
Dedication	→	Relatedness	.030	.548
Relatedness	→	Absorption	.045	.448
Absorption	→	Relatedness	-.025	.568
Vigour	→	Relatedness	-.033	.451
Relatedness	→	Vigour	**.141**	**.032**

Note. Estimates with $p < .05$ are shown in boldface. None of the relationships had a $p < .017$, which is the Bonferroni adjusted p value for three comparisons.

Discussion

Loneliness has been defined as deficits in relationships (Peplau & Perlman, 1982). In contrast, we argued that loneliness is broader than relationships and captures how valuable and important a person feels to other people. We argued that engagement and competence at work can fuel a sense of belonging. We argued that people would also turn to work when feeling lonely. To examine whether work engagement could satisfy belonging, and whether belonging could affect work engagement, we measured psychological needs, work engagement, and loneliness at two time points using a cross-lagged model. We did not find clear evidence that work engagement could satisfy loneliness. We did not find clear evidence that need satisfaction at work can lead to work engagement and that belonging leads to greater work engagement. We also did not find evidence that loneliness can lead to greater work engagement. Although some of the relationships were statistically significant before correcting for multiple comparisons, they were not significant after using a Bonferroni adjustment for three comparisons. We were not able to test if competence leads to belonging because of the poor fit of our competence measure. Contrary to expectations, we did not find clear evidence that engagement with work could fulfil belonging.

Our results are inconsistent with previous research that found that belonging encourages engagement. We found that isolation reduced vigour. This finding is inconsistent with Oyserman et al (2006), who found that minorities who fit in with their group showed more in class engagement and were less likely to drop out of school. The finding is also inconsistent with Good et al (2012), who found that women who felt more belonging with math were more likely to pursue math as a career.

In contrast, we also found support for the opposite direction of loneliness increasing engagement. We found collective disconnection increased vigour. This finding suggests people turn to work to alleviate loneliness. This is inconsistent with the pain model of loneliness, which argues that loneliness evolved as a signal to motivate reconnection (Cacioppo & Patrick, 2008). The pain model is normally thought to provoke socializing because belonging is normally characterized by interpersonal ties. If, however, belonging does reflect importance to others, then the pain model would predict that loneliness would make people turn to work. This link suggests that implicitly people believe that work can satisfy belonging, or that work can alleviate feelings of loneliness.

We did not find support for self-determination theory. Self-determination theory argues that satisfaction of the needs for relatedness, competence and autonomy leads to work engagement (Deci et al., 2001). We were unable to test the effect of competence due to poor fit. We did not find a relationship between autonomy or relatedness and work engagement. Previous studies have found that autonomy is associated with increased work engagement (Deci et al., 2001; Salanova et al., 2005), yet these studies were both cross-sectional. Given the association between engagement and

autonomy and the fact that we did not find autonomy leading to engagement nor engagement leading to autonomy, this suggests a third variable is driving both autonomy and engagement.

Limitations and Future Directions

The poor confirmatory factor analysis fit of competence was a limitation of the current research. We were not able to test a central hypothesis that competence can fulfil belonging. We were also unable to properly test self-determination theory, which argues that competence should lead to work engagement. Future research could use a different measure of competence and value to the group to test the idea that value to the group is central to belonging.

Another potential limitation is that we used Mechanical Turk workers, who work a variety of jobs. These workers may work different types of jobs than the general population and may display different patterns and levels in their work engagement and loneliness. The current study used a version of the UCLA loneliness scale that contain some ambiguous wording (Russell, 1996), which may have affected the results.

We did not find clear evidence that work engagement reduces loneliness, yet previous research has found that math belonging can be affected by entity beliefs, stereotypes, and effort expenditure concerns (Good et al., 2012; J. L. Smith et al., 2013). This discrepancy may be because of differences between loneliness and math belonging or because work engagement may not have been similar enough to entity beliefs, stereotypes, and effort expenditure concerns. Future research could examine if there is a relationship between math belonging and loneliness. Future research should also examine work variables besides work engagement, such as role ambiguity (Caplan & Jones, 1975) and task significance (Grant, 2008), that might more closely approximate entity beliefs, stereotypes, and effort expenditure concerns. Future research could also directly examine the relationship between loneliness and entity beliefs, stereotypes, and effort expenditure concerns.

Despite being unable to test a link between competence and belonging, some literature suggests that how people assess their competence may be relevant to belonging. There are two ways people can assess them competence: they can compare their performance to others or they can compare their performance to their previous performance (Nicholls, 1984). When people compare themselves to others, the more effort they put into a task, the less competent they feel; when people compare themselves to their previous performance, greater effort can indicate greater learning and more competence (Nicholls, 1984). For women, higher levels of perceived effort were associated with lower levels of math belonging (J. L. Smith et al., 2013). Previous research has found that happy people are less likely to compare themselves to others in competitive settings (Lyubomirsky & Ross, 1997), and happiness and loneliness are strongly inversely associated (Booth, Bartlett, & Bohnsack, 1992). Future research could assess whether lonely people are more likely to compare themselves to others, and examine the implications of this for their assessment of their competence.

Chapter 6

Conclusion

People form social connections easily and break connections reluctantly (Baumeister & Leary, 1995). Despite the motivation to connect with others, many people feel lonely (American College Health Association, 2010; Victor et al., 2005). Loneliness may result from the high level of residential mobility and low level of familiarity with others in the modern world. However, people should be motivated to connect with others when they feel lonely (Cacioppo & Patrick, 2008), counteracting familiarity and residential mobility. Thus, understanding loneliness will require an understanding of how belonging is pursued and why the pursuit of belonging is not effective for everyone.

In Chapters 2-4, we examined the pursuit of belonging through sociability. In Chapter 2, we addressed the decline of sociability over recent decades. The decline in sociability over recent decades has been found with many different indices: people are less likely to join unions, go to church, and join social clubs (Putnam, 2000). This decline in sociability is assumed to increase loneliness, although the literature has not directly examined if changes in loneliness have occurred (Cacioppo & Patrick, 2008). In Chapter 2, we addressed this gap by directly examining changes in loneliness over recent decades. In Study 1, we examined American college students using a cross-temporal meta-analysis. Cross-temporal meta-analysis uses existing studies that measure a construct—in this case loneliness— to compare the mean levels of a construct to the time the data were collected. In Study 2, we examined American high school students using the Monitoring the Future project. The Monitoring the Future project is a survey of a representative sample of high school students that measured a range of constructs, including loneliness, over different decades. In both Study 1 and 2, we found decreases in loneliness over recent decades. In Study 2, we found that high school students were reporting less loneliness at the same time as reporting poorer social networks. Given that sociability has declined while loneliness has also declined, Chapter 2 weakens the argument that sociability is a major determinate of loneliness. In Chapter 3, we directly addressed the relationship between sociability and loneliness.

In Chapter 3, we assessed the association between sociability and loneliness. We examined antecedents of sociability, and other factors that may explain the effects of sociability. We surveyed participants on reinforcement sensitivity, loneliness, communal orientation, acceptance, shyness and sociability. Although these other factors were strong predictors of loneliness, sociability remained a strong predictor of lower loneliness when accounting for the other predictors. However, Chapter 3 was cross-sectional, leaving causality ambiguous, so in Chapter 4 we assessed the relationship between sociability and loneliness using a longitudinal design. We also examined if different types

of sociability can be distinguished and if these different forms of sociability have different relationships with loneliness.

In Chapter 4, we used a longitudinal design to measure loneliness and sociability. Sociability was measured using an existing scale plus new items to examine if other aspects of sociability could be distinguished. We found new forms of sociability could be distinguished including desire for belonging, tendency to engage with strong ties, effort networking, effort with strong ties, and tendency to engage with weak ties. We found support for both the social pain model (Cacioppo & Patrick, 2008) and the social desensitization model (Moller et al., 2010). The social pain model was supported by the findings that aspects of loneliness (i.e., collective disconnection) led to more sociability (i.e., social enjoyment),, and isolation led to greater desire for belonging. The social desensitization model was supported by the findings that relational disconnection led to less social desire. We found some evidence that sociability reduces loneliness**.** The tendency to engage with strong ties reduced isolation, and low levels of shyness reduced feelings of isolation. In contrast, one form of sociability actually increased loneliness. The tendency to engage with strong ties led to more relational disconnection.

In the previous three chapters, we looked at pursuing belonging through sociability. In Chapter 5, we argued that people can derive a sense of belonging by being valuable to others, and people may become valuable to others through work. In Chapter 5, we presented the findings of a longitudinal study measuring work engagement and loneliness at two time points, three months apart. There was no clear evidence that loneliness affected worked engagement or that work engagement reduced loneliness over time.

Although we measured many forms of sociability and three forms of work engagement, we found very few variables that reduced belonging over time. No work engagement variable reduced loneliness. Additionally, formal programs aimed at reducing loneliness have been largely unsuccessful (Masi et al., 2011). The resistance of loneliness to change and the modest effects found in this thesis suggest loneliness is a phenomenon that requires more investigation, particularly from the viewpoint of the cognitive discrepancy model and alternative psychological needs.

Diverging Needs and the Cognitive Discrepancy Model

The effect of needs for autonomy and the cognitive discrepancy model may explain many of the findings of this thesis. Feelings of control can reduce feelings of loneliness (C. T. Hill et al., 1976; Schulz, 1976), while the cognitive discrepancy model argues that loneliness derives from a mismatch between expected and actual relationships (Peplau & Perlman, 1979; Russell et al., 2012). The findings of Chapter 2 of a reduction in loneliness may be explained by greater control that people in modern society have over their lives. The finding of Chapter 2 might also reflect lower

expectations of relationships as people become more individualistic (Hamamura, 2012). The finding of Chapter 3 that acceptance predicts loneliness could be because acceptance gives people a sense of control. One item of the acceptance scale asks about control in life (Bond et al., 2011). Acceptance may also be associated with lower expectations of relationships. The finding of Chapter 4 that sociability does not reliability reduce loneliness could be because striving unsuccessfully towards a goal may lower feelings of control and competence. The finding of Chapter 4 could be because striving for relationships may raise expectations of relationship or reflect raised expectations of social relationships.

Future Research

The results of this thesis show that when people pursue belonging, this pursuit does not reliably reduce loneliness. Future research should examine why pursuit does not reduce loneliness. Answering this question can be aided by the cognitive discrepancy model. Although the cognitive discrepancy model posits that expectations of relationships are a key predictor of loneliness, little research has gone into directly assessing how people develop expectations of relationships and if these expectations are a good target for intervention. It may be possible to change people's expectations through cognitive therapy or similar procedures.

The pursuit of belonging should also be examined from the perspective of emotional and social loneliness. Social loneliness reflects a lack of casual relationships, whereas emotional loneliness reflects a lack of intimate relationships (R. S. Weiss, 1973). These two types could predict different types of pursuit of belonging. People experiencing social loneliness may try to join clubs, whereas people experiencing emotional loneliness may try to become closer to existing relationships.

Other psychological needs also offer directions for future research. As mentioned previously, interventions to reduce loneliness have been largely unsuccessful (Masi et al., 2011). In particular, providing people with social support appears to be ineffective. This may be because it reduces feelings of control and introduces a social norm that the person should have more friends. Future research could attempt to increase a person's sense of control and competence, especially regarding social relationships, and future research could attempt to modify expectations of social networks.

Directly pursuing belonging by being sociable does not appear to reduce loneliness. Future research can examine the strong cross-sectional relationship between low acceptance and high loneliness in Chapter 3. Acceptance may be a factor that allows people to be self-reliant and could increase people's sense of control and competence. Future research could examine the relationship using longitudinal designs and interventions to increase acceptance, examining the effect on control and competence as well to understand the underlying processes. Interventions to increase

acceptance have been successful in improving mental health (Muto et al., 2011) so research on further interventions could be promising.

Future research can explore social interactions to understand why belonging pursuit is unreliable. It is likely that the different social situations are altering people's perception of social standing and expectations of relationships. Facebook may reduce people's estimates of their social standing by exposing people to more high status people who are presenting themselves in the best possible light (Blease, 2015). Facebook may also raise expectations of friendships by showing other people's apparent social success. Cities can also alter the perception of relative standing. People pay more attention to attractive women, and because there are more women in cities, there is more chance of women far above the average attractiveness, which can lead to overestimation of the average attractiveness, which can lead men to undervalue their partners (Kenrick & Gutierres, 1980; Maner et al., 2003). Future research can examine how these contextual factors affect belonging pursuit. For instance, future studies could examine if people living in cities are more likely to pursue belonging through altering physical attractiveness (wearing make-up, going to the gym) and whether this is an effective form of belonging pursuit. However, we found that loneliness has declined over time, suggesting that people can adapt to the modern environment. This adaption may be by becoming more self-reliant, rather than working on social ties because the decline in loneliness occurred in the context of diminished social relationships.

Studies Included in the Cross-Temporal Meta Analysis

Anderson, C. A., Miller, R. S., Riger, A. L., Dill, J. C., & Sedikides, C. (1994). Behavioral and characterological attributional styles as predictors of depression and loneliness: Review, refinement and test. *Journal of Personality and Social Psychology, 66*, 549-558. doi:10.1037/0022-3514.66.3.549

Austin, B. A. (1983). Factorial structure of the UCLA loneliness scale. *Psychological Reports, 53*, 883-889. doi:10.2466/pr0.1983.53.3.883

Barber, L. C., & Stoltennberg, C. D. (1994). Preference for counseling approach as a function of emotional locus of control and personal relevance. *Journal of Social and Clinical Psychology, 13*, 240-251. doi:10.1521/jscp.1994.13.3.240

Baumeister, A. L., & Storch, E. A. (2004). Correlations of religious beliefs with loneliness for an undergraduate sample. *Psychological Reports, 94*, 859-862. doi:10.2466/pr0.94.3.859-862

Booth, R., Bartlett, D., & Bohnsack, J. (1992). An examination of the relationship between happiness, loneliness, and shyness in college students. *Journal of College Student Development, 33*, 157-162.

Burger, J. M. (1995). Individual differences in preference for solitude. *Journal of Research in Personality, 29*, 85-108. doi:10.1006/jrpe.1995.1005

Canary, D. J., & Spitzberg, B. H. (1993). Loneliness and media gratifications. *Communication Research, 20*, 800-821. doi:10.1177/009365093020006003

Chang, E. C., Hirsch, J. K., Sanna, L. J., Jeglic, E. L., & Fabian, C. G. (2011). A preliminary study of perfectionism and loneliness as predictors of depressive and anxious symptoms in Latinas: A top-down test of a model. *Journal of Counseling Psychology, 58*, 441-448. doi:10.1037/a0023255

Chang, E. C., Sanna, L. J., Chang, R., & Bodem, M. R. (2008). A preliminary look at loneliness as a moderator of the link between perfectionism and depressive and anxious symptoms in college students: Does being lonely make perfectionistic strivings more distressing? *Behaviour Research and Therapy, 46*, 877-886. doi:10.1016/j.brat.2008.03.012

Chapman, B. P., & Hayslip, B. (2005). Incremental validity of a measure of emotional intelligence. *Journal of Personality Assessment, 85*, 154-169. doi:10.1207/s15327752jpa8502_08

Cheek, J. M., & Busch, C. M. (1981). The influence of shyness on loneliness in a new situation. *Personality and Social Psychology Bulletin, 7*, 572-577. doi:10.1177/014616728174008

Christensen, P. N., & Kashy, D. A. (1998). Perceptions of and by lonely people in initial social interaction. *Personality and Social Psychology Bulletin, 24*, 322-329. doi:10.1177/0146167298243009

Damsteegt, D. (1992). Loneliness and love attitudes. *Psychology, 29*, 62-65.

Davis, M. H., & Kraus, L. A. (1989). Social contact, loneliness, and mass-media use: A test of two hypotheses. *Journal of Applied Social Psychology, 19*, 1100-1124. doi:10.1111/j.1559-1816.1989.tb01242.x

Elliot, A. J., Gable, S. L., & Mapes, R. R. (2006). Approach and avoidance motivation in the social domain. *Personality and Social Psychology Bulletin, 32*, 378-391. doi:10.1177/0146167205282153

Finn, S., & Gorr, M. B. (1988). Social isolation and social support as correlates of television viewing motivations. *Communication Research, 15*, 135-158. doi:10.1177/009365088015002002

Frankel, A., & Prentice-Dunn, S. (1990). Loneliness and the processing of self-relevant information. *Journal of Social and Clinical Psychology, 9*, 303-315. doi:10.1521/jscp.1990.9.3.303

Gladstone, T. R. G., & Koenig, L. J. (1994). Sex-differences in depression across the high-school to college transition. *Journal of Youth and Adolescence, 23*, 643-669. doi:10.1007/BF01537634

Gordon, C. F., Juang, L. P., & Syed, M. (2007). Internet use and well-being among college students: Beyond frequency of use. *Journal of College Student Development, 48*, 674-688. doi:10.1353/csd.2007.0065

Gurtman, M. B. (1991). Evaluation the interpersonalness of personality scales. *Personality and Social Psychology Bulletin, 17*, 670-677. doi:10.1177/0146167291176010

Gurtman, M. B. (1993). Constructing personality tests to meet a structural criterion: Application of the interpersonal circumplex. *Journal of Personality, 61*, 237-263. doi:10.1111/j.1467-6494.1993.tb01033.x

Hawkley, L. C., Browne, M. W., & Cacioppo, J. T. (2005). How can I connect with thee? Let me count the ways. *Psychological Science, 16*, 798-804. doi:10.1111/j.1467-9280.2005.01617.x

Hays, R. D., & Dimatteo, M. R. (1987). A short-form measure of loneliness. *Journal of Personality Assessment, 51*, 69-81. doi:10.1207/s15327752jpa5101_6

Hicks, J. A., & King, L. A. (2009). Positive mood and social relatedness as information about meaning in life. *Journal of Positive Psychology, 4*, 471-482. doi:10.1080/17439760903271108

Hoglund, C. L., & Collison, B. B. (1989). Loneliness and irrational beliefs among college students. *Journal of College Student Development, 30*, 53-58.

Jackson, J., & Cochran, S. D. (1991). Loneliness and psychological distress. *Journal of Psychology, 125*, 257-262. doi:10.1080/00223980.1991.10543289

Johnson, H. D., LaVoie, J. C., & Mahoney, M. (2001). Interparental conflict and family cohesion predictors of loneliness, social anxiety, and social avoidance in late adolescence. *Journal of Adolescent Research, 16,* 304-318. doi:10.1177/0743558401163004

Joiner, T. E. (1997). Shyness and low social support as interactive diatheses, with loneliness as mediator: Testing an interpersonal-personality view of vulnerability to depressive symptoms. *Journal of Abnormal Psychology, 106,* 386-394. doi:10.1037/0021-843X.106.3.386

Jones, D. C., Bloys, N., & Wood, M. (1990). Sex roles and friendship patterns. *Sex Roles, 23,* 133-145. doi:10.1007/BF00289861

Kirkpatrick, L. A., Shillito, D. J., & Kellas, S. L. (1999). Loneliness, social support, and perceived relationships with God. *Journal of Social and Personal Relationships, 16,* 513-522. doi:10.1177/0265407599164006

Kobak, R. R., & Sceery, A. (1988). Attachment in late adolescence: Working models, affect regulation, and representations of self and others. *Child Development, 59,* 135-146. doi:10.2307/1130395

Lawler-Row, K. A., Hyatt-Edwards, L., Wuensch, K. L., & Karremans, J. C. (2011). Forgiveness and health: The role of attachment. *Personal Relationships, 18,* 170-183. doi:10.1111/j.1475-6811.2010.01327.x

Lee, R. M., Draper, M., & Lee, S. (2001). Social connectedness, dysfunctional interpersonal behaviors, and psychological distress: Testing a mediator model. *Journal of Counseling Psychology, 48,* 310-318. doi:10.1037/0022-0167.48.3.310

Lee, R. M., & Robbins, S. B. (2000). Understanding social connectedness in college women and men. *Journal of Counseling and Development, 78,* 484-491. doi:10.1002/j.1556-6676.2000.tb01932.x

Mahon, N. E., Yarcheski, T. J., & Yarcheski, A. (1997). Loneliness and health-related variables in young adults. *Perceptual and Motor Skills, 85,* 800-802. doi:10.2466/pms.1997.85.3.800

Mattanah, J. F., Hancock, G. R., & Brand, B. L. (2004). Parental attachment, separation-individuation, and college student adjustment: A structural equation analysis of mediational effects. *Journal of Counseling Psychology, 51,* 213-225. doi:10.1037/0022-0167.51.2.213

Montgomery, R. L., Haemmerlie, F. M., & Ray, D. M. (2003). Psychological correlates of optimism in college students. *Psychological Reports, 92,* 545-547. doi:10.2466/pr0.2003.92.2.545

Morahan-Martin, J., & Schumacher, P. (2003). Loneliness and social uses of the Internet. *Computers in Human Behavior, 19,* 659-671. doi:10.1016/S0747-5632(03)00040-2

Mounts, N. S., Valentiner, D. P., Anderson, K. L., & Boswell, M. K. (2006). Shyness, sociability, and parental support for the college transition: Relation to adolescents' adjustment. *Journal of Youth and Adolescence, 35*, 71-80. doi:10.1007/s10964-005-9002-9

Norman, G. J., Cacioppo, J. T., Morris, J. S., Malarkey, W. B., Berntson, G. G., & DeVries, A. C. (2011). Oxytocin increases autonomic cardiac control: Moderation by loneliness. *Biological Psychology, 86*, 174-180. doi:10.1016/j.biopsycho.2010.11.006

Ong, A. D., Rothstein, J. D., & Uchino, B. N. (2012). Loneliness accentuates age differences in cardiovascular responses to social evaluative threat. *Psychology and Aging, 27*, 190-198. doi:10.1037/a0025570

Overholser, J. C. (1992). Interpersonal dependency and social loss. *Personality and Individual Differences, 13*, 17-23. doi:10.1037/a0025570

Overholser, J. C. (1993). Idiographic, quantitative assessment of self-esteem. *Personality and Individual Differences, 14*, 639-646. doi:10.1016/0191-8869(93)90111-F

Ponzetti, J. J., & James, C. M. (1997). Loneliness and sibling relationships. *Journal of Social Behavior and Personality, 12*, 103-112.

Pruzan, K., & Isaacowitz, D. M. (2006). An attentional application of socioemotional selectivity theory in college students. *Social Development, 15*, 326-338. doi:10.1046/j.1467-9507.2006.00344.x

Russell, D., Cutrona, C. E., Rose, J., & Yurko, K. (1984). Social and emotional loneliness: An examination of Weiss's typology of loneliness. *Journal of Personality and Social Psychology, 46*, 1313-1321. doi:10.1037/0022-3514.46.6.1313

Russell, D., Peplau, L. A., & Cutrona, C. (1980). The revised UCLA Loneliness Scale: Concurrent and discriminant validity evidence. *Journal of Personality and Social Psychology, 39*, 472-480. doi:10.1037/0022-3514.39.3.472

Shaw, L. H., & Gant, L. M. (2002a). In defense of the internet: The relationship between Internet communication and depression, loneliness, self-esteem, and perceived social support. *Cyberpsychology & Behavior, 5*, 157-171. doi:10.1089/109493102753770552

Shaw, L. H., & Gant, L. M. (2002b). Users divided? Exploring the gender gap in Internet use. *Cyberpsychology & Behavior, 5*, 517-527. doi:10.1089/109493102321018150

Sloan, W. W., & Solano, C. H. (1984). The conversational styles of lonely males with strangers and roommates. *Personality and Social Psychology Bulletin, 10*, 293- 301. doi:10.1177/0146167284102016

Solano, C. H., & Koester, N. H. (1989). Loneliness and communication problems: Subjective anxiety or objective skills? *Personality and Social Psychology Bulletin, 15*, 126-133. doi:10.1177/0146167289151012

Spitzberg, B. H., & Hurt, H. T. (1987). The relationship of interpersonal competence and skills to reported loneliness over time. *Journal of Social Behavior and Personality, 2*, 157-172.

Taliaferro, L. A., Rienzo, B. A., Miller, M. D., Pigg, R. M., & Dodd, V. J. (2010). Potential mediating pathways through which sports participation relates to reduced risk of suicidal ideation. *Research Quarterly for Exercise and Sport, 81*, 328-339. doi:10.1080/02701367.2010.10599681

Tsai, F. F., & Reis, H. T. (2009). Perceptions by and of lonely people in social networks. *Personal Relationships, 16*, 221-238. doi:10.1111/j.1475-6811.2009.01220.x

Valentiner, D. P., Mounts, N. S., Dunk, A. M., & Gier-Lonsway, S. L. (2011). Shyness mindset: Applying mindset theory to the domain of inhibited social behavior. *Personality and Individual Differences, 50*, 1174-1179. doi:10.1016/j.paid.2011.01.021

Wheeler, L., Reis, H., & Nezlek, J. (1983). Loneliness, social interaction, and sex roles. *Journal of Personality and Social Psychology, 45*, 943-953. doi:10.1037/0022-3514.45.4.943

Williams, J. G., & Solano, C. H. (1983). The social reality of feeling lonely: Friendship and reciprocation. *Personality and Social Psychology Bulletin, 9*, 237-242. doi:10.1177/0146167283092007

References

Aknin, L. B., Sandstrom, G. M., Dunn, E. W., & Norton, M. I. (2011). It's the recipient that counts: Spending money on strong social ties leads to greater happiness than spending on weak social ties. *PLoS ONE, 6*, e17018.

Allport, G. W. (1937). The functional autonomy of motives. *The American Journal of Psychology, 50*, 141-156.

American College Health Association. (2010). Reference Group Executive Summary. Retrieved 28th November, 2011, from http://www.achancha.org/reports_ACHA-NCHAII.html

Axelrod, R., & Hamilton, W. D. (1981). The evolution of cooperation. *Science, 211*, 1390-1396.

Baron-Cohen, S. (1995). *Mindblindness*. MA: MIT Press.

Baumeister, R. F., DeWall, C. N., Ciarocco, N. J., & Twenge, J. M. (2005). Social exclusion impairs self-regulation. *Journal of Personality and Social Psychology, 88*(4), 589-604.

Baumeister, R. F., Heatherton, T. F., & Tice, D. M. (1994). *Losing control: How and why people fail at self-regulation*. Sydney: Academic Press.

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin, 117*, 497-529. doi: 10.1037/0033-2909.117.3.497

Baumeister, R. F., & Sommer, K. L. (1997). What do men want? Gender differences and two spheres of belongingness: Comment on Cross and Madson (1997). *Psychological Bulletin, 122*, 38-44. doi:10.1037/0033-2909.122.1.38

Baumeister, R. F., Twenge, J. M., & Nuss, C. K. (2002). Effects of social exclusion on cognitive processes: Anticipated aloneness reduces intelligent thought. *Journal of Personality and Social Psychology, 83*(4), 817.

Baumeister, R. F., Wotman, S. R., & Stillwell, A. M. (1993). Unrequited love: On heartbreak, anger, guilt, scriptlessness, and humiliation. *Journal of Personality and Social Psychology, 64*, 377-394.

Bearman, P., & Parigi, P. (2004). Cloning headless frogs and other important matters: Conversation topics and network structure. *Social Forces, 83*, 535-557. doi: 10.1353/sof.2005.0001

Bell, R. A. (1985). Conversational involvement and loneliness. *Communications Monographs, 52*, 218-235. doi: 10.1080/03637758509376107

Benjamini, Y., & Hochberg, Y. (1995). Controlling the false discovery rate: A practical and powerful approach to multiple testing. *Journal of the Royal Statistical Society. Series B (Methodological), 57*, 289-300.

Berridge, K. C., & Robinson, T. E. (1995). The mind of an addicted brain: neural sensitization of wanting versus liking. *Current Directions in Psychological Science*, 71-76.

Blease, C. (2015). Too many 'friends,'too few 'likes'? Evolutionary psychology and 'Facebook depression'. *Review of General Psychology, 19*, 1-13.

Bond, F. W., Hayes, S. C., Baer, R. A., Carpenter, K. M., Guenole, N., Orcutt, H. K., . . . Zettle, R. D. (2011). Preliminary psychometric properties of the Acceptance and Action Questionnaire – II: A revised measure of psychological flexibility and acceptance. *Behavior Therapy, 42*, 676688. doi: 10.1016/j.beth.2011.03.007

Booth, R., Bartlett, D., & Bohnsack, J. (1992). An examination of the relationship between happiness, loneliness, and shyness in college students. *Journal of College Student Development, 33*, 157-162.

Bradburn, N. M. (1969). *The structure of psychological well-being*. Oxford, England: Aldine.

Brown, L. H., Silvia, P. J., Myin-Germeys, I., & Kwapil, T. R. (2007). When the need to belong goes wrong: The expression of social anhedonia and social anxiety in daily life. *Psychological Science, 18*, 778-782.

Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K. A. Bollen & J. S. Long (Eds.), *Testing structural equation models* (pp. 136-162). London: Sage.

Bruch, M. A., Gorsky, J. M., Collins, T. M., & Berger, P. A. (1989). Shyness and sociability reexamined: A multicomponent analysis. *Journal of Personality and Social Psychology, 57*, 904-915. doi: 10.1037/0022-3514.57.5.904

Buss, D. M. (1990). The evolution of anxiety and social exclusion. *Journal of Social and Clinical Psychology, 9*, 196-201.

Buss, D. M. (2000). The evolution of happiness. *American Psychologist, 55*, 15-23.

Cacioppo, J. T., Hawkley, L. C., Berntson, G. G., Ernst, J. M., Gibbs, A. C., Stickgold, R., & Hobson, J. A. (2002). Do lonely days invade the nights? Potential social modulation of sleep efficiency. *Psychological Science, 13*, 384-387.

Cacioppo, J. T., & Patrick, W. (2008). *Loneliness: Human nature and the need for social connection*. New York: WW Norton & Company.

Caplan, R. D., & Jones, K. W. (1975). Effects of work load, role ambiguity, and type A personality on anxiety, depression, and heart rate. *Journal of Applied Psychology, 60*, 713-719.

Carver, C. S., & White, T. L. (1994). Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: The BIS/BAS Scales. *Journal of Personality and Social Psychology, 67*, 319-333. doi: 10.1037/0022-3514.67.2.319

Chang, E. C., Kahle, E. R., Yu, E. A., & Hirsch, J. K. (2014). Behavioral Inhibition System and Behavioral Activation System (BIS/BAS) motives and loneliness as predictors of eating disturbances in female college students: Interpersonal context matters. *Journal of Social and Clinical Psychology, 33*, 250-269. doi: 10.1521/jscp.2014.33.3.250

Cheek, J. M., & Busch, C. M. (1981). The influence of shyness on loneliness in a new situation. *Personality and Social Psychology Bulletin, 7*, 572-577. doi: 10.1177/014616728174008

Cheek, J. M., & Buss, A. H. (1981). Shyness and sociability. *Journal of Personality and Social Psychology, 41*, 330-339. doi: 10.1037/0022-3514.41.2.330

Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural Equation Modeling, 14*, 464-504.

Cheryan, S., Plaut, V. C., Davies, P. G., & Steele, C. M. (2009). Ambient belonging: How stereotypical cues impact gender participation in computer science. *Journal of Personality and Social Psychology, 97*, 1045-1060.

Civitci, N., & Civitci, A. (2009). Self-esteem as mediator and moderator of the relationship between loneliness and life satisfaction in adolescents. *Personality and Individual Differences, 47*, 954-958. doi:10.1016/j.paid.2009.07.022

Clark, D. M. T., & Loxton, N. J. (2012). Fear, psychological acceptance, job demands and employee work engagement: An integrative moderated meditation model. *Personality and Individual Differences, 52*, 893-897. doi: 10.1016/j.paid.2012.01.022

Clark, D. M. T., Loxton, N. J., & Tobin, S. J. (2015a). Declining loneliness over time: Evidence from American colleges and high schools. *Personality and Social Psychology Bulletin, 41*, 87-89.

Clark, D. M. T., Loxton, N. J., & Tobin, S. J. (2015b). Multiple mediators of reward and punishment sensitivity on loneliness. *Personality and Individual Differences, 72*, 101-106.

Clark, M. S., Oullette, R., Powell, M. C., & Milberg, S. (1987). Recipient's mood, relationship type, and helping. *Journal of Personality and Social Psychology, 53*, 94-103. doi: 10.1037/0022-3514.53.1.94

Coan, J. A., Schaefer, H. S., & Davidson, R. J. (2006). Lending a hand social regulation of the neural response to threat. *Psychological Science, 17*, 1032-1039.

Conrod, P. J., Stewart, S. H., Comeau, N., & Maclean, A. M. (2006). Efficacy of cognitive-behavioral interventions targeting personality risk factors for youth alcohol misuse. *Journal of Clinical Child and Adolescent Psychology, 35*, 550-563. doi: 10.1207/s15374424jccp3504_6

Coplan, R. J., Wilson, J., Frohlick, S. L., & Zelenski, J. (2006). A person-oriented analysis of behavioral inhibition and behavioral activation in children. *Personality and Individual Differences, 41*, 917-927. doi: 10.1016/j.paid.2006.02.019

Corr, P. J. (2005). Social exclusion and the hierarchical defense system: Comment on MacDonald and Leary (2005). *Psychological Bulletin, 131*, 231-236. doi: 10.1037/0033-2909.131.2.231

Corr, P. J., DeYoung, C. G., & McNaughton, N. (2013). Motivation and personality: A neuropsychological perspective. *Social and Personality Psychology Compass, 7*, 158-175. doi: 10.1111/spc3.12016

Cosmides, L. (1989). The logic of social exchange: Has natural selection shaped how humans reason? Studies with the Wason selection task. *Cognition, 31*, 187-276.

Crocker, J., & Major, B. (1989). Social stigma and self-esteem: The self-protective properties of stigma. *Psychological Review, 96*, 608-630. doi:10.1037/0033-295X.96.4.608

Davis, M. H. (1983). Measuring individual differences in empathy: Evidence for a multidimensional approach. *Journal of Personality and Social Psychology, 44*, 113-126. doi:10.1037/0022-3514.44.1.113

De Jong-Gierveld, J. (1978). The construct of loneliness: Components and measurement. *Essence: Issues in the Study of Ageing, Dying, and Death, 2*, 221-237.

Deci, E. L., Ryan, R. M., Gagné, M., Leone, D. R., Usunov, J., & Kornazheva, B. P. (2001). Need satisfaction, motivation, and well-being in the work organizations of a former eastern bloc country: A cross-cultural study of self-determination. *Personality and Social Psychology Bulletin, 27*, 930-942.

Deters, F. G., & Mehl, M. R. (2013). Does posting Facebook status updates increase or decrease loneliness? An online social networking experiment. *Social Psychological and Personality Science, 4*, 579-586. doi:10.1177/1948550612469233

DeWall, C. N., Baumeister, R. F., & Vohs, K. D. (2008). Satiated with belongingness? Effects of acceptance, rejection, and task framing on self-regulatory performance. *Journal of Personality and Social Psychology, 95*, 1367-1382. doi:10.1037/a0012632

Dey, E. L., Astin, A. W., & Korn, W. S. (1991). *The American freshman: Twenty-five year trends, 1966-1990*. Los Angeles: Higher Education Research Institute, UCLA.

DiTommaso, E., Brannen-McNulty, C., Ross, L., & Burgess, M. (2003). Attachment styles, social skills and loneliness in young adults. *Personality and Individual Differences, 35*, 303-312. doi: 10.1016/S0191-8869(02)00190-3

Dovidio, J. F., Kawakami, K., & Gaertner, S. L. (2002). Implicit and explicit prejudice and interracial interaction. *Journal of Personality and Social Psychology, 82*, 62-68. doi:10.1037/0022-3514.82.1.62

Dunbar, R. (1998). *Grooming, gossip, and the evolution of language*. London: Faber & Faber.

Dunbar, R., & Shultz, S. (2007). Evolution in the social brain. *Science, 317*, 1344-1347.

Dunn, E. W., Biesanz, J. C., Human, L. J., & Finn, S. (2007). Misunderstanding the affective consequences of everyday social interactions: the hidden benefits of putting one's best face forward. *Journal of Personality and Social Psychology, 92*, 990-1005.

Eisenberger, N. I., Lieberman, M. D., & Williams, K. D. (2003). Does rejection hurt? An fMRI study of social exclusion. *Science, 302*, 290-292.

Epley, N., & Schroeder, J. (2014). Mistakenly seeking solitude. *Journal of Experimental Psychology: General, 143*, 1980-1999.

Fan, X., & Sivo, S. A. (2007). Sensitivity of fit indices to model misspecification and model types. *Multivariate Behavioral Research, 42*, 509-529.

Festinger, L., Schachter, S., & Back, K. (1963). *Social pressures in informal groups*. Oxford, England: Harper.

Fiedler, K., Kutzner, F., & Krueger, J. I. (2012). The long way from α-error control to validity proper problems with a short-sighted false-positive debate. *Perspectives on Psychological Science, 7*, 661-669.

Finkel, S. E. (1995). *Causal analysis with panel data*. London: Sage Publications.

Fischer, C. S. (2011). *Still connected: Family and friends in America since 1970*. New York: Russell Sage Foundation.

Fiske, S. T., Cuddy, A. J., & Glick, P. (2007). Universal dimensions of social cognition: Warmth and competence. *Trends in Cognitive Sciences, 11*, 77-83.

Fleeson, W., Malanos, A. B., & Achille, N. M. (2002). An intraindividual process approach to the relationship between extraversion and positive affect: Is acting extraverted as" good" as being extraverted? *Journal of Personality and Social Psychology, 83*, 1409-1422.

Floyd, F. J., & Widaman, K. F. (1995). Factor analysis in the development and refinement of clinical assessment instruments. *Psychological Assessment, 7*, 286-299. doi:10.1037/1040-3590.7.3.286

Forest, A. L., & Wood, J. V. (2012). When social networking is not working: Individuals with low self-esteem recognize but do not reap the benefits of self-disclosure on facebook. *Psychological Science, 23*, 295-302. doi:10.1177/0956797611429709

Fountain, H. (2006, July 2). The lonely American just got a bit lonelier, *The New York Times*. Retrieved from http://www.nytimes.com

Frère, C. H., Krützen, M., Mann, J., Connor, R. C., Bejder, L., & Sherwin, W. B. (2010). Social and genetic interactions drive fitness variation in a free-living dolphin population. *Proceedings of the National Academy of Sciences, 107*, 19949-19954.

Fries, A. B. W., Ziegler, T. E., Kurian, J. R., Jacoris, S., & Pollak, S. D. (2005). Early experience in humans is associated with changes in neuropeptides critical for regulating social behavior. *Proceedings of the National Academy of Sciences, 102*, 17237-17240.

Gardner, W. L., Pickett, C. L., & Brewer, M. B. (2000). Social exclusion and selective memory: How the need to belong influences memory for social events. *Personality and Social Psychology Bulletin, 26*, 486-496.

Gardner, W. L., Pickett, C. L., Jefferis, V., & Knowles, M. (2005). On the outside looking in: Loneliness and social monitoring. *Personality and Social Psychology Bulletin, 31*, 1549-1560.

Gentile, B., Twenge, J. M., & Campbell, W. K. (2010). Birth cohort differences in self-esteem, 1988-2008: A cross-temporal meta-analysis. *Review of General Psychology, 14*, 261-268. doi:10.1037/a0019919

Gerber, J., & Wheeler, L. (2009). On being rejected: A meta-analysis of experimental research on rejection. *Perspectives on Psychological Science, 4*, 468-488.

Gonsalkorale, K., & Williams, K. D. (2007). The KKK won't let me play: Ostracism even by a despised outgroup hurts. *European Journal of Social Psychology, 37*, 1176-1186.

Good, C., Rattan, A., & Dweck, C. S. (2012). Why do women opt out? Sense of belonging and women's representation in mathematics. *Journal of Personality and Social Psychology, 102*, 700-717.

Granovetter, M. S. (1973). The strength of weak ties. *American Journal of Sociology, 78*, 1360-1380.

Grant, A. M. (2008). The significance of task significance: Job performance effects, relational mechanisms, and boundary conditions. *Journal of Applied Psychology, 93*, 108-124.

Gray, J. A. (1982). *Neuropsychological theory of anxiety: An investigation of the septal-hippocampal system*. New York: Oxford University Press.

Gray, J. A., & McNaughton, N. (2000). *The neuropsychology of anxiety: An enquiry into the functions of the septo-hippocampal system*. Oxford: Oxford University Press.

Hackett, R. A., Hamer, M., Endrighi, R., Brydon, L., & Steptoe, A. (2012). Loneliness and stress-related inflammatory and neuroendocrine responses in older men and women. *Psychoneuroendocrinology, 37*, 1801-1809. doi:10.1016/j.psyneuen.2012.03.016

Hamamura, T. (2012). Are cultures becoming individualistic? A cross-temporal comparison of individualism–collectivism in the United States and Japan. *Personality and Social Psychology Review, 16*, 3-24. doi: 10.1177/1088868311411587

Hamlin, J. K., Wynn, K., & Bloom, P. (2007). Social evaluation by preverbal infants. *Nature, 450*, 557-559.

Hawkley, L. C., Browne, M. W., & Cacioppo, J. T. (2005). How can I connect with thee? Let me count the ways. *Psychological Science, 16*, 798-804. doi:10.1111/j.1467-9280.2005.01617.x

Hayes, A. F., & Preacher, K. J. (2014). Statistical mediation analysis with a multicategorical independent variable. *British Journal of Mathematical and Statistical Psychology, 67*, 451-470. doi: 10.1111/bmsp.12028

Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (2003). *Acceptance and commitment therapy: An experiential approach to behavior change*. New York: The Guilford Press.

Heym, N., Ferguson, E., & Lawrence, C. (2008). An evaluation of the relationship between Gray's revised RST and Eysenck's PEN: Distinguishing BIS and FFFS in Carver and White's BIS/BAS scales. *Personality and Individual Differences, 45*, 709-715. doi: 10.1016/j.paid.2008.07.013

Hill, C. T., Rubin, Z., & Peplau, L. A. (1976). Breakups before marriage: The end of 103 affairs. *Journal of Social Issues, 32*, 147-168.

Hill, K. R., Walker, R. S., Bozicevic, M., Eder, J., Headland, T., Hewlett, B., . . . Wood, B. (2011). Co-residence patterns in hunter-gatherer societies show unique human social structure. *Science, 331*, 1286-1289.

Holt-Lunstad, J., Smith, T. B., & Layton, J. B. (2010). Social relationships and mortality risk: A meta-analytic review. *PLoS Medicine, 7*, e1000316. doi:10.1371/journal.pmed.1000316

House, J. S., Landis, K. R., & Umberson, D. (1988). Social relationships and health. *Science, 241*, 540-545.

Hu, L., & Bentler, P. M. (1998). Fit indices in covariance structure modeling: Sensitivity to underparameterized model misspecification. *Psychological Methods, 3*, 424-453.

Jackson, C. J. (2009). Jackson-5 scales of revised Reinforcement Sensitivity Theory (r-RST) and their application to dysfunctional real world outcomes. *Journal of Research in Personality, 43*, 556-569. doi: 10.1016/j.jrp.2009.02.007

James, W. (1980). *The principles of psychology*. London: Macmillan.

Jamieson, J. P., Harkins, S. G., & Williams, K. D. (2010). Need threat can motivate performance after ostracism. *Personality and Social Psychology Bulletin, 36*, 690-702.

Johnston, L. D., Bachman, J. G., O'Malley, P. M., & Schulenberg, J. E. (2012a). *Monitoring the future: A continuing study of American youth (8th- and 10th-Grade surveys)*. Inter-university Consortium for Political and Social Research (ICPSR) Retrieved from http://doi.org/10.3886/ICPSR34574.v1.

Johnston, L. D., Bachman, J. G., O'Malley, P. M., & Schulenberg, J. E. (2012b). *Monitoring the future: A continuing study of American youth (12th-Grade survey)*. Inter-university Consortium for Political and Social Research (ICPSR) Retrieved from http://doi.org/10.3886/ICPSR34861.v1.

Joiner, T. E., Catanzaro, S. J., Rudd, M. D., & Rajab, M. H. (1999). The case for a hierarchical, oblique, and bidimensional structure of loneliness. *Journal of Social and Clinical Psychology, 18*, 47-75.

Jones, W. H., Hobbs, S. A., & Hockenbury, D. (1982). Loneliness and social skill deficits. *Journal of Personality and Social Psychology, 42*, 682-689. doi: 10.1037/0022-3514.42.4.682

Kanai, R., Bahrami, B., Duchaine, B., Janik, A., Banissy, M. J., & Rees, G. (2012). Brain structure links loneliness to social perception. *Current Biology, 22*, 1975-1979. doi:10.1016/j.cub.2012.08.045

Kenrick, D. T., & Gutierres, S. E. (1980). Contrast effects and judgments of physical attractiveness: When beauty becomes a social problem. *Journal of Personality and Social Psychology, 38*, 131-140.

Kiecolt-Glaser, J. K., Ricker, D., George, J., Messick, G., Speicher, C., Garner, W., & Glaser, R. (1984). Urinary cortisol levels, cellular immunocompetency, and loneliness in psychiatric inpatients. *Psychosomatic Medicine, 46*, 15-23.

King, K. B., & Reis, H. T. (2012). Marriage and long-term survival after coronary artery bypass grafting. *Health Psychology, 31*, 55.

Kingsbury, A., Coplan, R. J., Weeks, M., & Rose-Krasnor, L. (2013). Covering all the BAS's: A closer look at the links between BIS, BAS, and socio-emotional functioning in childhood. *Personality and Individual Differences, 55*, 521-526. doi: 10.1016/j.paid.2013.04.021

Klein, K., & Boals, A. (2001). Expressive writing can increase working memory capacity. *Journal of Experimental Psychology General, 130*, 520-533. doi: 10.1037/0096-3445.130.3.520

Konrath, S. H., Chopik, W. J., Hsing, C. K., & O'Brien, E. (2014). Changes in adult attachment styles in American college students over time: A meta-analysis. *Personality and Social Psychology Review*. doi: 10.1177/1088868314530516

Konrath, S. H., O'Brien, E. H., & Hsing, C. (2011). Changes in dispositional empathy in American college students over time: A meta-analysis. *Personality and Social Psychology Review, 15*, 180-198. doi:10.1177/1088868310377395

Korte, C., & Kerr, N. (1975). Response to altruistic opportunities in urban and nonurban settings. *The Journal of Social Psychology, 95*, 183-184.

Kunz, P. R., & Woolcott, M. (1976). Season's greetings: From my status to yours. *Social Science Research, 5*, 269-278.

Kurzban, R., & Leary, M. R. (2001). Evolutionary origins of stigmatization: The functions of social exclusion. *Psychological Bulletin, 127*, 187-208.

Lang, J., Bliese, P. D., Lang, J. W., & Adler, A. B. (2011). Work gets unfair for the depressed: Cross-lagged relations between organizational justice perceptions and depressive symptoms. *Journal of Applied Psychology, 96*, 602-618.

Lau, S., & Gruen, G. E. (1992). The social stigma of loneliness: Effect of target person's and perceiver's sex. *Personality and Social Psychology Bulletin, 18*, 182-189. doi:10.1177/0146167292182009

Lipsey, M. W., & Wilson, D. B. (2001). *Practical meta-analysis*. London: Sage Publications.

Litt, A., Khan, U., & Shiv, B. (2009). Lusting while loathing: Parallel counterdriving of wanting and liking. *Psychological Science, 21*, 118-125.

Little, T. D., Preacher, K. J., Selig, J. P., & Card, N. A. (2007). New developments in latent variable panel analyses of longitudinal data. *International Journal of Behavioral Development, 31*, 357-365.

Loe, M. (2012). Actively guarding against loneliness: How to connect with others, while protecting your independence. Retrieved from https://www.psychologytoday.com/blog/aging-our-way/201206/actively-guarding-against-loneliness

Lyubomirsky, S., & Ross, L. (1997). Hedonic consequences of social comparison: A contrast of happy and unhappy people. *Journal of Personality and Social Psychology, 73*, 1141-1157.

Maner, J. K., DeWall, C. N., Baumeister, R. F., & Schaller, M. (2007). Does social exclusion motivate interpersonal reconnection? Resolving the "porcupine problem.". *Journal of Personality and Social Psychology, 92*, 42-55. doi:10.1037/0022-3514.92.1.42

Maner, J. K., Kenrick, D. T., Becker, D. V., Delton, A. W., Hofer, B., Wilbur, C. J., & Neuberg, S. L. (2003). Sexually selective cognition: Beauty captures the mind of the beholder. *Journal of Personality and Social Psychology, 85*, 1107-1120.

Markland, D. (2007). The golden rule is that there are no golden rules: A commentary on Paul Barrett's recommendations for reporting model fit in structural equation modelling. *Personality and Individual Differences, 42*, 851-858.

Marsh, H. W., Hau, K.-T., & Wen, Z. (2004). In search of golden rules: Comment on hypothesis-testing approaches to setting cutoff values for fit indexes and dangers in overgeneralizing Hu and Bentler's (1999) findings. *Structural Equation Modeling, 11*, 320-341.

Masi, C. M., Chen, H. Y., Hawkley, L. C., & Cacioppo, J. T. (2011). A meta-analysis of interventions to reduce loneliness. *Personality and Social Psychology Review, 15*, 219-266.

McKenna, K. Y. A., & Bargh, J. A. (1998). Coming out in the age of the Internet: Identity "demarginalization" through virtual group participation. *Journal of Personality and Social Psychology, 75*, 681-694. doi:10.1037/0022-3514.75.3.681

McPherson, M., Smith-Lovin, L., & Brashears, M. E. (2006). Social isolation in America: Changes in core discussion networks over two decades. *American Sociological Review, 71*, 353-375. doi:10.1177/000312240607100301

Meade, A. W., & Craig, S. B. (2012). Identifying careless responses in survey data. *Psychological Methods, 17*, 1-19. doi: 10.1037/a0028085

Milgram, S. (1970). The experience of living in cities. *Science, 167*, 1461-1468.

Mill, J. (1873). *Autobiography*. New York: Columbia University Press.

Moller, A. C., Deci, E. L., & Elliot, A. J. (2010). Person-level relatedness and the incremental value of relating. *Personality and Social Psychology Bulletin, 36*, 754-767.

Mook, D. (1983). In defense of external invalidity. *American Psychologist, 38*, 379-387. doi: 10.1037/0003-066X.38.4.379

Murray, H. A. (1938). *Explorations in personality: A clinical and experimental study of fifty men of college age*. Oxford: Oxford University Press.

Murray, S. L., Bellavia, G. M., Rose, P., & Griffin, D. W. (2003). Once hurt, twice hurtful: How perceived regard regulates daily marital interactions. *Journal of Personality and Social Psychology, 84*, 126-147.

Muto, T., Hayes, S. C., & Jeffcoat, T. (2011). The effectiveness of Acceptance and Commitment Therapy bibliotherapy for enhancing the psychological health of Japanese college students living abroad. *Behavior Therapy, 42*, 323-355. doi: 10.1016/j.beth.2010.08.009

Newson, L., Postmes, T., Lea, S. G., & Webley, P. (2005). Why are modern families small? Toward an evolutionary and cultural explanation for the demographic transition. *Personality and Social Psychology Review, 9*, 360-375. doi: 10.1207/s15327957pspr0904_5

Nicholls, J. G. (1984). Achievement motivation: Conceptions of ability, subjective experience, task choice, and performance. *Psychological Review, 91*, 328-346.

Nowak, M. A., & Sigmund, K. (2005). Evolution of indirect reciprocity. *Nature, 437*, 1291-1298.

Oishi, S., & Schimmack, U. (2010). Residential mobility, well-being, and mortality. *Journal of Personality and Social Psychology, 98*, 980-994.

Oyserman, D., Brickman, D., Bybee, D., & Celious, A. (2006). Fitting in matters: Markers of in-group belonging and academic outcomes. *Psychological Science, 17*, 854-861.

Paxton, P. (1999). Is social capital declining in the United States? A multiple indicator assessment. *American Journal of Sociology, 105*, 88-127. doi:10.1086/210268

Penninx, B. W., Van Tilburg, T., Kriegsman, D. M., Deeg, D. J., Boeke, A. J. P., & van Eijk, J. T. M. (1997). Effects of social support and personal coping resources on mortality in older age: the Longitudinal Aging Study Amsterdam. *American Journal of Epidemiology, 146*, 510-519.

Peplau, L. A., & Perlman, D. (1979). Blueprint for a social psychological theory of loneliness *Love and attraction* (pp. 101-110). Oxford: Pergamon Press.

Peplau, L. A., & Perlman, D. (1982). Perspectives on loneliness. In L. A. Peplau & D. Perlman (Eds.), *Loneliness: A sourcebook of current theory, research and therapy* (pp. 1-18). New York: John Wiley & Sons.

Perneger, T. V. (1998). What's wrong with Bonferroni adjustments. *British Medical Journal, 316*, 1236-1238.

Pinker, S. (1997). *How the mind works*. New York: Norton.

Pinker, S. (2011). *The better angels of our nature: Why violence has declined*. New York: Viking.

Pressman, S. D., Cohen, S., Miller, G. E., Barkin, A., Rabin, B. S., & Treanor, J. J. (2005). Loneliness, social network size, and immune response to influenza vaccination in college freshmen. *Health Psychology, 24*, 297-306. doi: 10.1037/0278-6133.24.3.297

Putnam, R. D. (2000). *Bowling alone: The collapse and revival of American community*. Sydney: Simon & Schuster.

Qualter, P., Brown, S. L., Munn, P., & Rotenberg, K. J. (2010). Childhood loneliness as a predictor of adolescent depressive symptoms: an 8-year longitudinal study. *European Child & Adolescent Psychiatry, 19*, 493-501.

Rand, D. G. (2012). The promise of Mechanical Turk: How online labor markets can help theorists run behavioral experiments. *Journal of Theoretical Biology, 299*, 172-179. doi: 10.1016/j.jtbi.2011.03.004

Reis, H. T., Sheldon, K. M., Gable, S. L., Roscoe, J., & Ryan, R. M. (2000). Daily well-being: The role of autonomy, competence, and relatedness. *Personality and Social Psychology Bulletin, 26*, 419-435.

Reis, H. T., Wheeler, L., Kernis, M. H., Spiegel, N., & Nezlek, J. (1985). On specificity in the impact of social participation on physical and psychological health. *Journal of Personality and Social Psychology, 48*, 456-471. doi:10.1037/0022-3514.48.2.456

Rook, K. S. (1987). Social support versus companionship: Effects on life stress, loneliness, and evaluations by others. *Journal of Personality and Social Psychology, 52*, 1132-1147.

Rosenberg, R. A. (2014). Is your life plagued by loneliness? Tips to overcome it. Retrieved from http://www.huffingtonpost.com/ross-a-rosenberg/loneliness_b_4648417.html

Rozin, P., & Royzman, E. B. (2001). Negativity bias, negativity dominance, and contagion. *Personality and Social Psychology Review, 5*, 296-320. doi:10.1207/S15327957PSPR0504_2

Russell, D. W. (1996). UCLA Loneliness Scale (Version 3): Reliability, validity, and factor structure. *Journal of Personality Assessment, 66*(1), 20-40.

Russell, D. W., Cutrona, C. E., McRae, C., & Gomez, M. (2012). Is loneliness the same as being alone? *The Journal of psychology, 146*, 7-22.

Russell, D. W., Cutrona, C. E., Rose, J., & Yurko, K. (1984). Social and emotional loneliness: An examination of Weiss's typology of loneliness. *Journal of Personality and Social Psychology, 46*, 1313-1321. doi: 10.1037/0022-3514.46.6.1313

Russell, D. W., Peplau, L. A., & Cutrona, C. (1980). The revised UCLA Loneliness Scale: Concurrent and discriminant validity evidence. *Journal of Personality and Social Psychology, 39*, 472-480. doi: 10.1037/0022-3514.39.3.472

Saklofske, D., & Yackulic, R. (1989). Personality predictors of loneliness. *Personality and Individual Differences, 10*, 467-472. doi:10.1016/0191-8869(89)90011-1

Salanova, M., Agut, S., & Peiro, J. M. (2005). Linking organizational resources and work engagement to employee performance and customer loyalty: The mediation of service climate. *Journal of Applied Psychology, 90*, 1217-1227.

Sandstrom, G. M., & Dunn, E. W. (2013). Is efficiency overrated? Minimal social interactions lead to belonging and positive affect. *Social Psychological and Personality Science, 5*, 437-442.

Sandstrom, G. M., & Dunn, E. W. (2014). Social interactions and well-being: The surprising power of weak ties. *Personality and Social Psychology Bulletin, 40*, 910-922.

Sarason, I. G., Sarason, B. R., Shearin, E. N., & Pierce, G. R. (1987). A brief measure of social support: Practical and theoretical implications. *Journal of Social and Personal Relationships, 4*, 497-510. doi:10.1177/0265407587044007

Schaufeli, W. B., Bakker, A. B., & Salanova, M. (2006). The measurement of work engagement with a short questionnaire: A cross-national sample. *Educational and Psychological Measurement, 66*, 701-716.

Schaufeli, W. B., Taris, T. W., & van Rhenen, W. (2008). Workaholism, burnout, and work engagement: Three of a kind or three different kinds of employee well-being? *Applied psychology, 57*, 173-203.

Schino, G. (2001). Grooming, competition and social rank among female primates: A meta-analysis. *Animal Behaviour, 62*, 265-271.

Schino, G., di Sorrentino, E. P., & Tiddi, B. (2007). Grooming and coalitions in Japanese macaques (Macaca fuscata): Partner choice and the time frame reciprocation. *Journal of Comparative Psychology, 121*, 181-188.

Schmidt, L. A. (1999). Frontal brain electrical activity in shyness and sociability. *Psychological Science, 10*, 316-320.

Schulz, R. (1976). Effects of control and predictability on the physical and psychological well-being of the institutionalized aged. *Journal of Personality and Social Psychology, 33*, 563-573.

Segrin, C., Powell, H. L., Givertz, M., & Brackin, A. (2003). Symptoms of depression, relational quality, and loneliness in dating relationships. *Personal Relationships, 10*, 25-36. doi:10.1111/1475-6811.00034

Seyfarth, R., & Cheney, D. (2012). The evolutionary origins of friendship. *Annual Review of Psychology, 63*, 153-177.

Sharma, S., Mukherjee, S., Kumar, A., & Dillon, W. R. (2005). A simulation study to investigate the use of cutoff values for assessing model fit in covariance structure models. *Journal of Business Research, 58*, 935-943.

Sherif, M., Harvey, O., White, B. J., Hood, W. R., & Sherif, C. W. (1988). *The robbers cave experiment: Intergroup conflict and cooperation*. Middletown, CT: Wesleyan University Press.

Shostak, M. (1983). *Nisa: The life and words of a !Kung woman*. New York: Harvard University Press.

Shumaker, S. A., & Stokols, D. (1982). Residential mobility as a social issue and research topic. *Journal of Social Issues, 38*, 1-19.

Silk, J. B., Beehner, J. C., Bergman, T. J., Crockford, C., Engh, A. L., Moscovice, L. R., . . . Cheney, D. L. (2009). The benefits of social capital: Close social bonds among female baboons enhance offspring survival. *Proceedings of the Royal Society B: Biological Sciences, 276*, 3099-3104.

Silk, J. B., Beehner, J. C., Bergman, T. J., Crockford, C., Engh, A. L., Moscovice, L. R., . . . Cheney, D. L. (2010). Strong and consistent social bonds enhance the longevity of female baboons. *Current Biology, 20*, 1359-1361. doi: 10.1016/j.cub.2010.05.067

Simpson, J. A., Collins, W. A., Tran, S., & Haydon, K. C. (2007). Attachment and the experience and expression of emotions in romantic relationships: A developmental perspective. *Journal of Personality and Social Psychology, 92*, 355-367.

Smillie, L. D., Pickering, A. D., & Jackson, C. J. (2006). The new reinforcement sensitivity theory: Implications for personality measurement. *Personality and Social Psychology Review, 10*, 320-335. doi: 10.1207/s15327957pspr1004_3

Smith, J. L., Lewis, K. L., Hawthorne, L., & Hodges, S. D. (2013). When trying hard isn't natural: Women's belonging with and motivation for male-dominated STEM fields as a function of effort expenditure concerns. *Personality and Social Psychology Bulletin, 39*, 131-143. doi: 10.1177/0146167212468332

Smith, K. S., Berridge, K. C., & Aldridge, J. W. (2011). Disentangling pleasure from incentive salience and learning signals in brain reward circuitry. *Proceedings of the National Academy of Sciences, 108*, E255-E264.

Steblay, N. M. (1987). Helping behavior in rural and urban environments: A meta-analysis. *Psychological Bulletin, 102*, 346-356.

Steele, C. M. (1997). A threat in the air: How stereotypes shape intellectual identity and performance. *American Psychologist, 52*, 613-629.

Stokes, J. P. (1985). The relation of social network and individual different variables to loneliness. *Journal of Personality and Social Psychology, 48*(4), 981-990. doi: 10.1037//0022-3514.48.4.981

Stravynski, A., & Boyer, R. (2001). Loneliness in relation to suicide ideation and parasuicide: A population wide study. *Suicide and Life-Threatening Behavior, 31*, 32-40. doi: 10.1521/suli.31.1.32.21312

Tobin, S. J., Vanman, E. J., Verreynne, M., & Saeri, A. K. (2014). Threats to belonging on Facebook: Lurking and ostracism. *Social Influence*, 1-12. doi: 10.1080/15534510.2014.893924

Tooby, J., & Cosmides, L. (1996). Friendship and the banker's paradox: Other pathways to the evolution of adaptations for altruism. *Proceedings of the British Academy, 88*, 119-143.

Trzesniewski, K. H., & Donnellan, M. B. (2010). Rethinking "generation me": A study of cohort effects from 1976-2006. *Perspectives on Psychological Science, 5*, 58-75. doi:10.1177/1745691609356789

Twenge, J. M. (1997). Changes in masculine and feminine traits over time: A meta-analysis. *Sex roles, 36*, 305-325. doi: 10.1007/BF02766650

Twenge, J. M. (2000). The age of anxiety? The birth cohort change in anxiety and neuroticism, 1952-1993. *Journal of Personality and Social Psychology, 79*, 1007-1021. doi:10.1037/0022-3514.79.6.1007

Twenge, J. M. (2001a). Birth cohort changes in extraversion: A cross-temporal meta-analysis, 1966-1993. *Personality and Individual Differences, 30*, 735-748. doi:10.1016/S0191-8869(00)00066-0

Twenge, J. M. (2001b). Changes in women's assertiveness in response to status and roles: A cross-temporal meta-analysis, 1931-1993. *Journal of Personality and Social Psychology, 81*, 133-145. doi:10.1037/0022-3514.81.1.133

Twenge, J. M., Baumeister, R. F., DeWall, C. N., Ciarocco, N. J., & Bartels, J. M. (2007). Social exclusion decreases prosocial behavior. *Journal of Personality and Social Psychology, 92*, 56-66.

Twenge, J. M., Baumeister, R. F., Tice, D. M., & Stucke, T. S. (2001). If you can't join them, beat them: Effects of social exclusion on aggressive behavior. *Journal of Personality and Social Psychology, 81*, 1058-1069.

Twenge, J. M., & Campbell, W. K. (2001). Age and birth cohort differences in self-esteem: A cross-temporal meta-analysis. *Personality and Social Psychology Review, 5*, 321-344. doi:10.1207/S15327957PSPR0504_3

Twenge, J. M., & Campbell, W. K. (2010). Birth cohort differences in the monitoring the future dataset and elsewhere: Further evidence for generation me - Commentary on Trzesniewski & Donnellan (2010). *Perspectives on Psychological Science, 5*, 81-88. doi:10.1177/1745691609357015

Twenge, J. M., Campbell, W. K., & Gentile, B. (2012). Increases in individualistic words and phrases in American books, 1960–2008. *PLoS ONE, 7*, e40181. doi: 10.1371/journal.pone.0040181

Twenge, J. M., & Kasser, T. (2013). Generational changes in materialism and work centrality, 1976-2007: Associations with temporal changes in societal insecurity and materialistic role modeling. *Personality and Social Psychology Bulletin, 39*, 883-897. doi: 10.1177/0146167213484586

U.S. Census Bureau. (2007). *Table 289. Degrees earned by level and race/ethnicity*. Retrieved from www.census.gov/compendia/statab/2010/tables/10s0289.xls.

U.S. Census Bureau. (2010). *Statistical abstract of the United States*. Washington, DC: Government Printing Office.

Victor, C. R., Scambler, S. J., Bowling, A., & Bond, J. (2005). The prevalence of, and risk factors for, loneliness in later life: A survey of older people in Great Britain. *Ageing and Society, 25*, 357-375.

Wei, M., Russell, D. W., & Zakalik, R. A. (2005). Adult attachment, social self-efficacy, self-disclosure, loneliness, and subsequent depression for freshman college students: A longitudinal study. *Journal of Counseling Psychology, 52*, 602-614.

Weiss, R. F., Boyer, J. L., Lombardo, J. P., & Stich, M. H. (1973). Altruistic drive and altruistic reinforcement. *Journal of Personality and Social Psychology, 25*, 390-400. doi: 10.1037/h0034235

Weiss, R. S. (1973). *Loneliness: The experience of emotional and social isolation*. Massachusettes: MIT Press.

Wesselmann, E. D., Cardoso, F. D., Slater, S., & Williams, K. D. (2012). To be looked at as though air: Civil attention matters. *Psychological Science, 23*, 166-168.

White, T. L., & Depue, R. A. (1999). Differential association of traits of fear and anxiety with norepinephrine- and dark-induced pupil reactivity. *Journal of Personality and Social Psychology, 77*, 863-877. doi: 10.1037/0022-3514.77.4.863

Wilbert, J. R., & Rupert, P. A. (1986). Dysfunctional attitudes, loneliness, and depression in college students. *Cognitive Therapy and Research, 10*, 71-77.

Wilder, D. A., & Thompson, J. E. (1980). Intergroup contact with independent manipulations on in-group and out-group interaction. *Journal of Personality and Social Psychology, 38*, 589-603.

Wirth, L. (1938). Urbanism as a way of life. *American Journal of Sociology, 44*, 1-24.

Woody, S. R. (1996). Effects of focus of attention on anxiety levels and social performance of individuals with social phobia. *Journal of Abnormal Psychology, 105*, 61-69. doi: 10.1037/0021-843X.105.1.61

Xanthopoulou, D., Bakker, A. B., Demerouti, E., & Schaufeli, W. B. (2009). Work engagement and financial returns: A diary study on the role of job and personal resources. *Journal of Occupational and Organizational Psychology, 82*, 183-200.

Zadro, L., Williams, K. D., & Richardson, R. (2004). How low can you go? Ostracism by a computer is sufficient to lower self-reported levels of belonging, control, self-esteem, and meaningful existence. *Journal of Experimental Social Psychology, 40*, 560-567.

Zajonc, R. B. (1968). Attitudinal effects of mere exposure. *Journal of Personality and Social Psychology, 9*, 1-27.